RADIOSONDE REPLACEMENT SYSTEM (RRS) WORKSTATION USER GUIDE

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Office of Climate, Water, and Weather Services/Observing Services Division

RECORD OF CHANGES

Change Number	Effective Date	Initials	Date Entered	Remarks

When you enter a change to this handbook make a notation on this page. Pen and ink changes within this handbook can be indicated by a vertical line (▌) in the outside margin adjacent to your marked subject matter or data. This redline or highlighting method is illustrated to the right of this paragraph. ▌

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1. Introduction

1.1 Purpose

This training guide is designed to teach how to take upper air observations with the Radiosonde Replacement System (RRS) workstation using Sippican radiosondes. In writing this guide, a basic knowledge of taking an observation with the RRS Telemetry Receiving System is assumed. This knowledge may be gained by reading the sections of WSOH-10 relating to the Telemetry Receiving System, from the RRS Training Video, and hands-on training. We also assume previous experience using a personal computer with a Windows based operating system.

1.2 Organization

This training guide has 13 chapters and five appendices. Chapter 2 provides a brief description of the RRS system and the RRS workstation. Chapter 3 uses actual flight data to allow the operator to become familiar with user features by running a simulated flight. Chapter 4 provides an overview of the many displays and window options available with the RRS software during Rework. Chapter 5 describes the process of entering station data into RRS. **These data must be entered before most RRS functions can be used.** Chapter 6 provides an overview of the Utilities windows under the Tools Option on the RRS Main window.

Chapter 7 describes the process of Checking the System Status prior to taking a flight. Chapters 8 through 11 deal with the process of taking an actual RRS observation. Chapter 12 discusses the transfer of archive files after a flight. Chapter 13 describes what to do when special in-flight conditions arise. Appendix A provides a list of abbreviations and acronyms used with RRS and the upper-air program. Appendix B provides codes for the Clouds/Weather entry in the prerelease data. Appendix C provides brief instructions on using the RRS Offline Maintenance software for providing maintenance personnel with more detailed information of equipment problems. Appendix D provides a list of the RRS Popup Messages in alphabetical order. Appendix E provides helpful hints in troubleshooting problems during Pre-flight, In-flight and Post-flight activities.

1.3 How to Use This Training Guide

To begin, it would be advisable to read Chapter 2 to get a brief overview of the RRS components. Chapter 3 should be the next chapter read. Chapter 3 provides instructions on using actual data from an archived RRS flight.

Chapter 4 provides examples of displays and windows available during Rework that the operator must be familiar with and know the additional options available. This chapter in conjunction with Chapter 3 provides a basic understanding and the ability to exercise the software without having to release a radiosonde.

Chapter 5, Entering Station Data, describes the process of inputting information about the station into RRS. These data are entered by The Site Manager or Site Administrator. Chapter 6 provides additional information on the RRS software Utilities that impact flight management, application, and administrative functions. Chapter 7 covers basic information on the Hardware Status window. The Hardware Status window provides the operator with a quick check of RRS Hardware, Surface Observing Equipment, and Communication Equipment and Lines. Detailed information may be obtained from the RRS Offline Maintenance software. (See instructions in Appendix C)

Chapter 8 shows the specific steps performed during the Pre-release sequence. Chapter 9 illustrates how to Check and Edit Data. Chapter 10 covers transmitting of Coded Messages. Chapter 11 discusses flight termination and software and operator interaction. Chapter 12 discusses the archiving and transferring of flight data..

Chapters 13 should be reviewed as soon as time permits. This chapter covers many of the special in-flight situations you will encounter and provides instruction on how to handle such occurrences. When unusual cases arise, the instructions provide guidance in deciding how to deal with such cases. Report these cases with details on how they were handled to your regional upper air coordinator. The Appendices should be read for additional information when needed.

1.4 RRS Software Adjustments for Sippican Instruments

Sippican radiosondes will be used for the initial deployment. However, the RRS software is designed to allow multiple radiosondes to be used. The Station Data Display has a field titled Radiosonde Type from the drop-down other radiosonde types may be selected. (see Section 5.2.2). This entry is made once and only has to be changed if there is a change in the type of radiosonde being used. The software automatically displays the proper screens for the type of radiosonde selected.

2. System Description

2.1 Introduction

This chapter provides an introduction to the RRS system. First, there is a brief discussion of the system hardware and the RRS workstation.

2.2 System Overview

The RRS tracking and receiving equipment tracks the radiosonde and collects the signals the instrument emits. The signals are received from the Telemetry Receiving System(TRS) and Global Positioning System (GPS) and transmitted via the Signal Processing System (SPS) through a RS232 cable to the workstation. The Signal Processing System (SPS), which is within the TRS, converts these signals to a digital (numeric) form that can be used by the RRS software program. The RRS program has a user interface that allows you to display and edit upper air data during the flight. When the coded messages are ready for transmission, they are sent from the RRS workstation to AWIPS via LAN, or a modem. The modem converts the data into a form that can be transmitted over telephone lines.

2.3 System Hardware

The RRS system hardware consists of the following items:

a. Telemetry Receiving System (TRS)
b. Signal Processing System (SPS)
c. RRS Workstation (CPU/Monitor/Keyboard)
d. Printer
e. External Hard Drive (Backup)
f. RSOIS Sensors
g. Precision Digital Barometer (PDB)
h. Cable to RRS Tracking Equipment
i. GPS Base Antenna
j. Multiplexer
k. GPS Repeater
l. Console Display Unit (CDU)
m. GPS Radiosonde

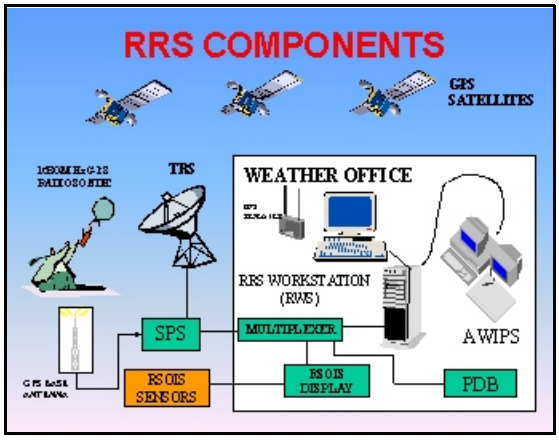


Exhibit 2-1 RRS Components

2.4 Telemetry Receiving System (TRS)

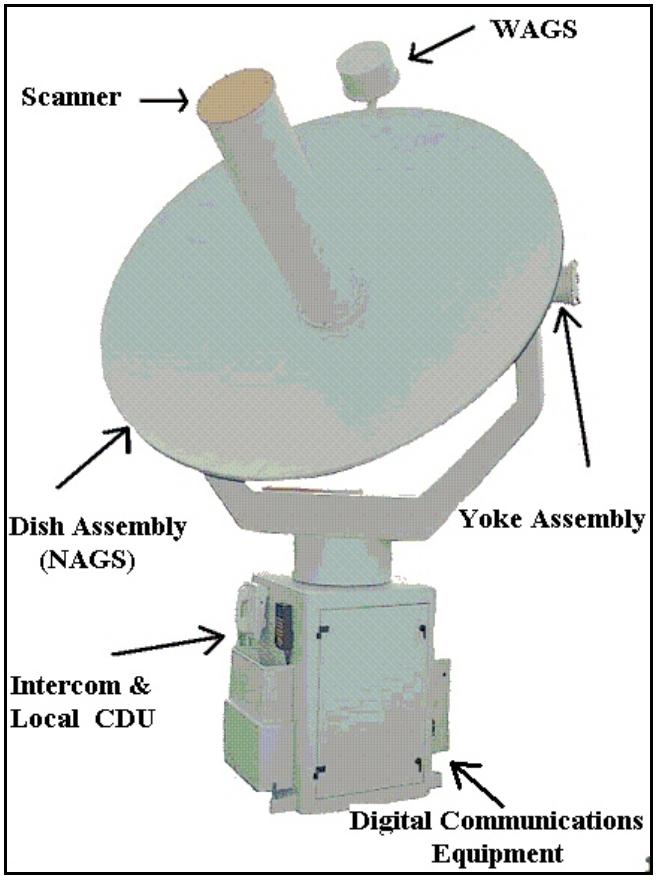


Exhibit 2-2 Telemetry Receiving System (TRS)

The TRS consists of three units (See Exhibit 2-2): The antenna unit, the workstation unit, and launch area unit. The TRS workstation unit is not the RWS workstation, it consist of the Digital Communication Equipment (DCE) and the workstation intercom.

The antenna is a 2 meter parabolic dish consisting of two halves for ease of transportation and assembly. Within the antenna unit , there are three major groups. They are the Radio Frequency (RF) group, Yoke group, and the Rack group.

The RF group consist of the following six RF sensitive elements plus associated cables:

Dish - Narrow Angle Gathering Sensor (NAGS) - 15 degree beam width
Receiver assembly
Scanner low noise amplifier (LNA) assembly
Helix assembly
Wide angle gathering sensor (WAGS) - 100 degree beam width
Counter-weights
Associated cables

The Yoke group consist of six major assemblies plus associated cables. These assemblies and cables are the physical motion elements:

Yoke	Cross-member
Elevation motor drive assembly	Azimuth motor drive assembly
Motor Control Unit	Slipring assembly
Associated cables	

The Rack group consists of thirteen major assemblies plus associated cables. The assemblies and cables are the remaining elements within the antenna unit:

19 inch Rack	Bulkhead
Interconnection box	System communication assembly (SCA)
Two heater assemblies	Air conditioner (AC)
Signal Processing System (SPS)	Power supply assembly (PSA)
Uninterruptible power supply (UPS)	Local area intercom
Local Control Display Unit (CDU)	Associated cables
Antenna Digital Communication Equipment (DCE)	

2.5 Signal Processing System (SPS)

The TRS is designed to receive telemetry from any radiosonde that meets the RRS specifications. The TRS delivers the radiosonde telemetry signal as 10.7 MHz IF to the SPS located in the 19 inch Rack below the antenna. The SPS includes a power supply, GPS receiver, 10.7 MHz IF front end, and a processor.

The SPS provides baseband conversion of the modulation on the IF input. This baseband data is provided to the processor within the SPS. The GPS receiver provides the reference position and velocity data to the processor within the SPS. The processor within the SPS provides the corrections to the radiosonde data and provides it to the workstation.

2.6 Radiosonde Replacement System Workstation

The RRS workstation, at a minimum will have a 3.2 GHz Pentium 4 processor and motherboard. The memory will be at least 1024 megabytes (Mb) RDRAM memory with a 160 gigabyte (Gb) hard drive. It will have a rewritable CD-RW along with a 3.5 inch floppy diskette drive. The workstation will use Windows XP as an operating system. The workstation will have a 19 inch monitor, a telecommunications modem, 104 PS2 keyboard, a mouse, and an external 160 gigabyte (Gb) hard drive for backup of all flight data. These specific characteristics will change with time, but will not be less than what has been described.

The RRS software is stored on the hard disk, along with the data, archive, and station data files. The Offline Maintenance software is also placed on the hard drive to help identify equipment problems.

2.6.1 Radiosonde Replacement System (RRS) Workstation Software

The RRS workstation collects and processes upper air data from radiosondes and provides a means to interactively display, edit, and transmit these data. The system is very interactive and allows a high degree of control over the data products that are generated and transmitted.

With the RRS software, prerelease data such as the current weather and flight equipment information is entered from the keyboard of the RRS workstation. Radiosonde baselining is also done while at the workstation. Once the radiosonde is released, the workstation's interactive capabilities allows the display of data in real time and the ability to edit data of doubtful quality. Data are stored automatically, and flights may be reworked with the RRS software. In case of a power failure during a flight, RRS allows the flight to be saved and transmitted to the point where power was lost. Data are also archived for transmission to the National Climatic Data Center (NCDC).

2.6.2 Operator Commands

Commands to the RRS software are entered through the mouse or the keyboard. The mouse is the primary means of entering commands. The keys function with the RRS software similar to their operation with any other typical windows based program. When typing data or commands using the alphabetic keys, it doesn't matter whether uppercase or lowercase letters are used. The RRS software is not case sensitive.

2.6.3 Compact Disk Drive

The CD drive reads data from CD's and writes data to them. This disk drive is also referred to as the D: drive. The disk drive is located at the top slot of the tower. CD's are inserted into the CD drive by pressing the button to the right and below the opening or slot. CD's play an important role in data storage in RRS. Each CD can hold 650 Mb of data.

The light on the lower left part of the disk drive turns on when the CD drive is either reading or writing data.

2.6.3.1 Different Compact Disks

The RRS software comes on a CD and there are also two different types of data CD's. One data CD is for training and the other data CD contains operational flight data. The operational flight data CD may be used for studies, outside users or a wide variety of purposes which includes serving as a secondary backup of the archive files. The following sections describe the software, training and data CD's.

2.6.3.2.1 RRS Software CD

The RRS software is placed on a compact disk and is loaded by the ESA on the RRS workstation when the workstation and pre-deployment kit arrives. This is typically 90 days prior to deployment. The software will be reloaded by the ESA when the deployment team completes the survey. The RRS software updates will be sent to the field on a compact disk. Inserting the disk in the compact disk drive and at the Start button selecting the drive and clicking on Run will load the software. The operator need only select "Continue".

Exhibit 12-3 RRS Software CD

2.6.3.2.2 Training CD

A substantial part of the RRS training will involve displaying and editing data from previously recorded flights using the Simulated and Rework Flight Options (Chapters 3 and 4). The Training CD contains the .mdb data files for the Rework flights. The Training CD will also be used to demonstrate normal flight operations and possible options within the Tools option in Chapter 3. The Training CD should be loaded on the RRS workstation and used in conjunction with the RRS User Manual to become familiar with the various operator features before doing Live Flights. The label on the Training CD looks like this:

Exhibit 2-4 RRS Training CD

2.6.3.2.3 Data CD

The flight data is stored as one-second meteorological and position data during a flight. The data is stored in a database and is also stored in a backup directory on an external hard drive in case of a system hang-up during a flight, such as a power failure. A Data CD is manually generated normally after flight termination and going to the Offline Mode. It is used to copy flight data for archival or use by other data users. It also ensures that data is backed-up should either the external or internal hard drives fail.

Anytime the flight contains unusual events of a meteorological or programming nature, go to the Tools option select Utilities and then select Export to copy the .mdb files (see Chapter 3). Please forward these to NWS Headquarters (WSH), Observing Systems Branch, W/OPS22 Upper Air Program. Include a short narrative and any supporting printer plots/lists of the data. They have the capability to reproduce the flight at WSH and will try to determine the problem or cause of the event(s).

The label on the Data CD will be made up by the site and should clearly state on the disk or on an attached sheet of paper, the files contained on the disk.

The .mdb files contains 1-second meteorological and position data, as well as a copy of the radiosonde calibration and station data. The data CD is used for reworking observations after termination to correct a problem that was not found during a flight.

After flight termination, data are archived on the hard disk. RRS then prompts for the insertion of the Data CD into the CD drive, and the data are copied from the hard disk onto the Data CD. Data for several hundred flights may be stored on one CD. The average size of a .mdb file on the Data CD is 1,000,000 bytes (1Mb). Each station requires only one CD per month. A Data CD may also be used as a secondary backup or for making copies for distribution to outside upper air users or for local station use.

NOTE: Always use a permanent felt-tip pen when writing on a label that is attached to a CD. Using a ball-point pen can damage the CD's.

CD Type	Data on CD	Input Data	Output Data
1	**Training**	**Training Data**	**1-second flight data**	
2	**Data**	**Flight Data**	**1-second flight data**	**Used to Archive, Rework or Analysis Flight Performance**

2.7 RRS Training DVD

A key part of learning about the RRS System is operator training. Operator training consist of using the RRS User Guide and WSOH-10, along with exercising the RRS software on the workstation utilizing the Training CD. Besides the Training CD there is a RRS Training DVD that provides a detailed overview of entire RRS Tracking System, RRS software, and key components. It also details normal operator actions and shows corrective measures that should be taken to ensure a successful flight. This DVD was created by Mr. Bruce Sherbon with help of the staff at WFO Tulsa, OK and the support of Southern Region Headquarters. This DVD should be viewed by all new observers and used for refresher training to ensure proper procedures are followed.

The RRS Training DVD is broken up into sections and may be viewed a chapter at a time on any computer workstation having a DVD drive. (See Exhibit 2-5)

Exhibit 2-5 RRS DVD

2.8 Printer

The RRS Workstation will have a color printer to enable the operators to print color copies of the plot and tabular data. This will make quality control and training an easier task with items of importance highlighted by the software or the operator prior to printing.

2.9 RSOIS Sensors

The surface observing sensors will be located within 200 meters of the release point unless a waiver has been issued by WSH. The RSOIS will report:

Temperature
Dewpoint/RH
Wind Speed/Direction/Gusts

If RSOIS is not available or inoperative a site may if authorized, use the ASOS sensors or manually take the observations using a combination of handheld and fixed equipment.

2.10 Precision Digital Barometer (PDB)

The pressure will be measured by the Precision Digital Barometer (PDB). It will be located at the baseline point and will be used to check the accuracy of the radiosonde pressure sensor. The radiosonde pressure sensor must be within $\pm$ 5 hPa of the PDB reading or the instrument must be rejected. A replacement PDB is sent to each upper-air site annually. It is calibrated and input with the specific site data at NWSH. The PDB it replaces is returned to NWS Headquarters for re-calibration.

2.11 GPS Base Station Antenna

Located inside the radome, above the TRS, the GPS base station antenna provides the Global Positioning System data from up to 24 satellites, 8 additional satellites used for backup, all in geosynchrinized orbit. The GPS antenna must receive data from at least four satellites to compute positional data including height.

Location is determined by positional change in the radiosonde's location in relationship to the satellites. This information is transmitted via the radiosonde's GPS antenna back to the GPS ground station. Accuracy of wind data will improve as much as five times that of wind calculations using RDF equipment.

2.12 GPS Repeater

A GPS repeater will be at all stations. The GPS repeater will be located inside the office and surveyed for an established location at the baseline location to ensure GPS lock-on is acquired during the baseline check.

NOTE: GPS repeater location and baseline location are established and should not be moved without prior WSH approval. Each site will have a primary and backup location surveyed.

2.13 GPS Radiosonde

GPS radiosondes transmit a signal that provides pressure, temperature, and relative humidity readings. Positional data is calculated by a change in radiosonde GPS position relative to the GPS Base Station location. Data is transmitted from the radiosonde at 1-second intervals back to the ground tracking system.

3. Simulated Flight - Overview of Operations

3.1 Introduction

This chapter provides instructions on using the Simulated Flight function of RRS. The Simulated Flight mode is used in training to provide as close to Live Flight operations and commands as possible. Some of the activities the Simulated Flight mode has that the Rework mode does not are:

1. Running through the Pre-release sequence, including going through the radiosonde baseline screen.
2. Provides an opportunity to see PTU and Position data being received and processed as the data is received and processed.
3. Allows the operator to interact with the software and take operator actions as the flight ingests new data. These functions may be marking data, changing release times or changing the surface observation, plotting and zooming in on data plots, or generating messages. Having the capability to see how these functions effect the flight process is extremely valuable in providing the observer a realistic view of how the operator interacts with the software during the flight.

The Simulated Flight mode contains nearly all of the capabilities for displaying and editing data that are available in the Live Flight option of RRS. Learning to use the Simulated Flight mode will allow you to become familiar with many RRS features before you take an actual observation.

Before you begin training in the Simulated Flight mode, you should have a basic knowledge of using a windows based computer and should have read Chapter 2 of this training guide.

3.2 Simulated - Prerelease Data Tutorial

Before the radiosonde is released, information about the flight must be supplied to RRS. In this chapter you will see an example of these prerelease data for a sample flight and get some experience in manipulating the data. The prerelease data are displayed on five separate screens. Each of the screens is dealt with in a separate section.

3.2.1 Pre-flight Sequence

1. RRS workstation should be left on to receive security updates. If not on, turn on the RRS workstation and visually check the time in the lower right corner of the desktop. Do a Time Check if needed, following these steps:.

   A. Right click on the time in the lower right corner of the desktop and select the "Adjust Date/Time" option.

   B. Keeping the window open, go into Internet Explorer and go to http://www.time.gov and select UTC at the bottom of the screen. Update the date/time if needed. (See paragraph 8.1.1 for more details)

2. Log on using your individual Username and Password. Trainees will be taken automatically into the RWS software after logging in.

3. The RWS Window will appear with the Security Warning message. Read the message, and click on the OK button. (See Exhibit 3-2)

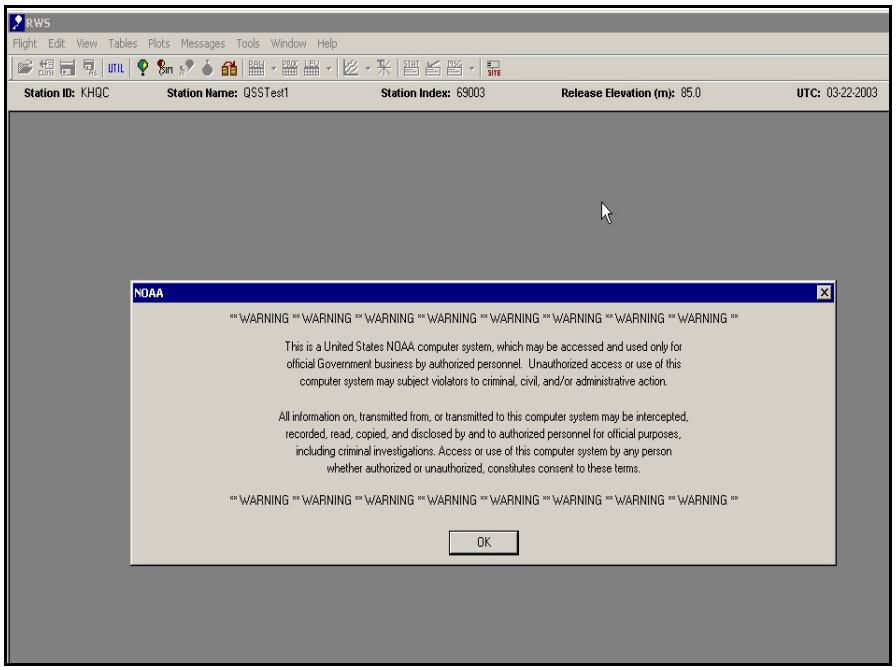


Exhibit 3-2 RWS Window with Security Warning Message

4. Flight Options Window appears. (See Exhibit 3-3) Select Run a simulated flight.

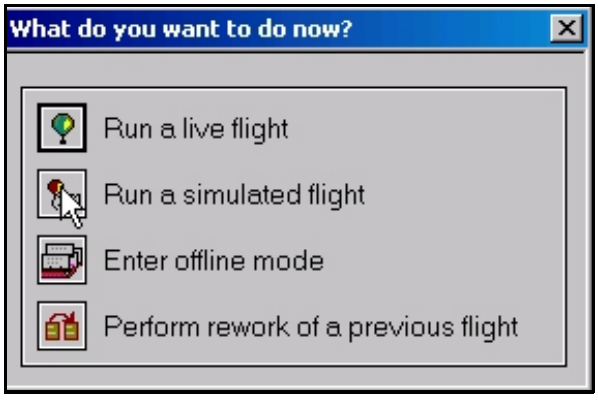


Exhibit 3-3 Flight Options Window

5. The GPS Status Window appears. (See Exhibit 3-4) This window indicates no matches throughout the entire simulated flight. In a live flight a minimum of 4 matches are required to process position and calculate height data. If a match were present, numbers would appear in place of the gray boxes in a single column.

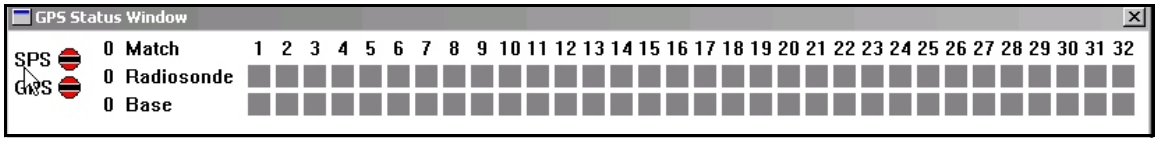


Exhibit 3-4 GPS Status Window

NOTE: Numbers indicate the signal to noise ratio. Numbers typically should be between the upper 20's and lower 60's.

6. The Hardware Status window appears. (See Exhibit 3-5) The various components except for the SPS and GPS should have a green check mark when operating properly. The SPS and GPS status can not be determined until a radiosonde has been prepared and connected to the battery during the baseline process. Chapter 7 titled "Checking the System Status" provides detailed information on the various hardware components checked and recommended actions. Click the "Close" button to go to the next screen.

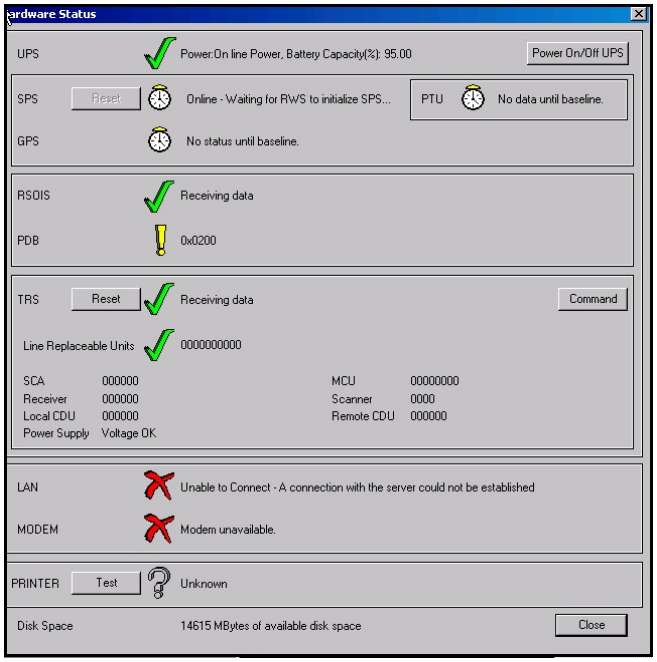


Exhibit 3-5 Hardware Status window

7. The UPS Status window appears almost immediately after the Hardware Status Display, alerting you that the UPS has now been turned on. Click OK. (See Exhibit 3-6)

Exhibit 3-6 UPS Status window

NOTE: During a Live Flight, this message may display anytime the UPS goes ON or OFF battery power or changes status.

8. The Administrative Display, the Antenna Orientation/TRS Display and the Status Messages Display all are displayed with the GPS Status Window below them. (See Exhibit 3-7)

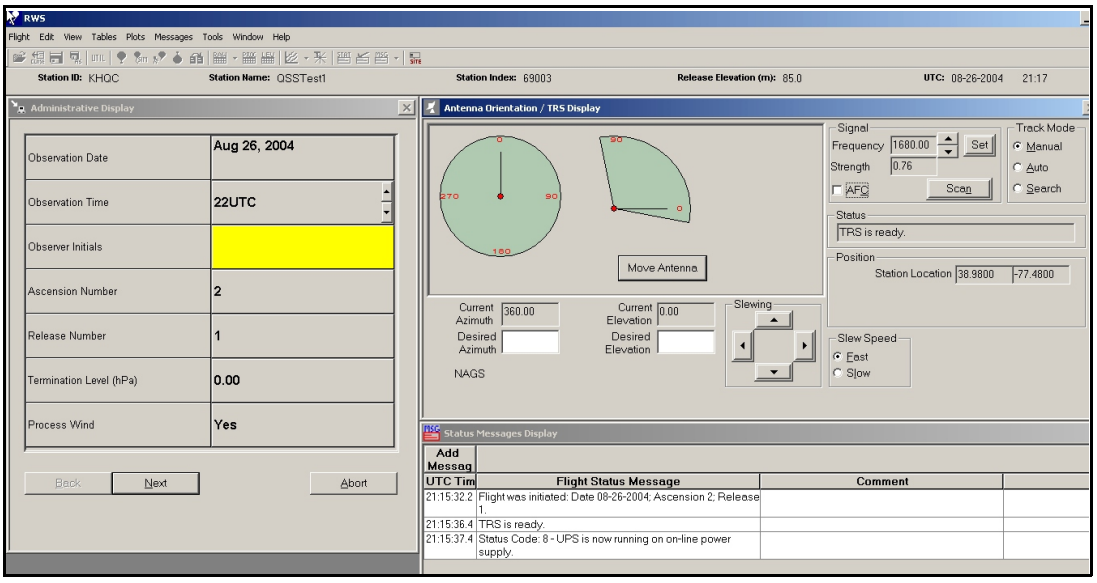


Exhibit 3-7 Administrative/Antenna & TRS/Status Message Displays

9. Fill in your initials in the Administrative Display and then click the "Next" button. (See Exhibit 3-8)

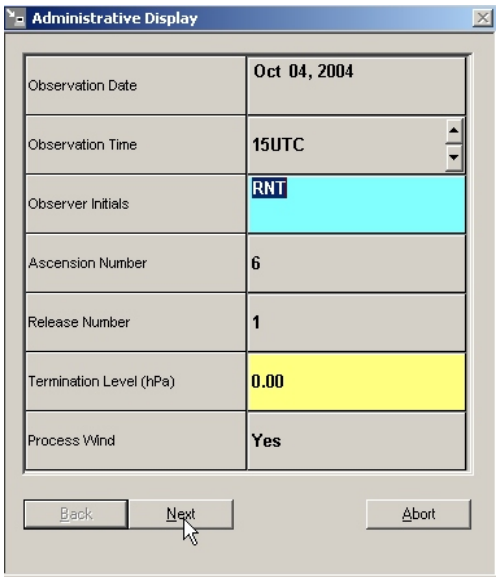


Exhibit 3-8 Administrative Display

10. The Equipment Display appears, fill in the blocks. (See Exhibit 3-9) Radiosonde Serial Number and Calibration File Location need not be filled in. This information is transmitted from the radiosonde at baseline. *The radiosonde serial number is on the label at the bottom of the instrument.* All balloon information may be obtained off each balloon's label. The amount of gas is the nozzle lift used. The flight train length must be between 70 - 120 feet. The columns for Train Regulator, Lighting Unit, and Parachute are all Yes or No responses. The operator may toggle to get the desired answer. Click the Next button when done.

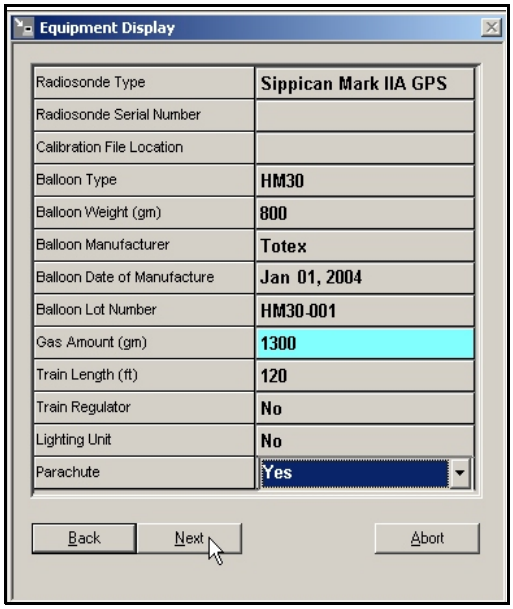


Exhibit 3-9 Equipment Display

11. The Surface Observation Display appears. (See Exhibits 3-9)) The simulated flight has surface observation data, click the "Refresh" button to populate. (See Exhibit 3-10) In Live Flight, if RSOIS is installed, clicking "Refresh" will populate all columns except the Cloud/WX block. Fill in the Cloud/WX block using codes provided in Appendix B. Correct cloud data is imperative. It directly influences the Radiation Correction which impacts the RADAT and all Coded Messages.

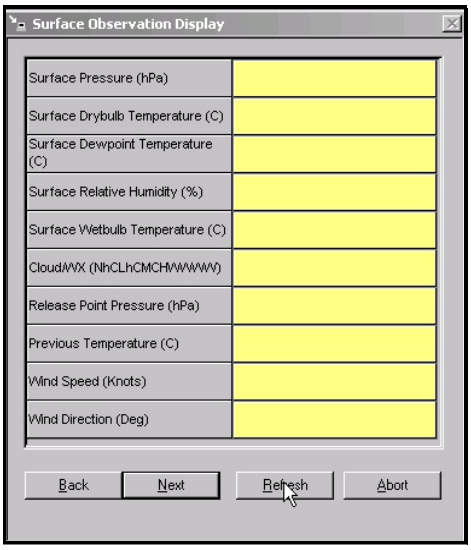


Exhibit 3-9 Surface Observation Display

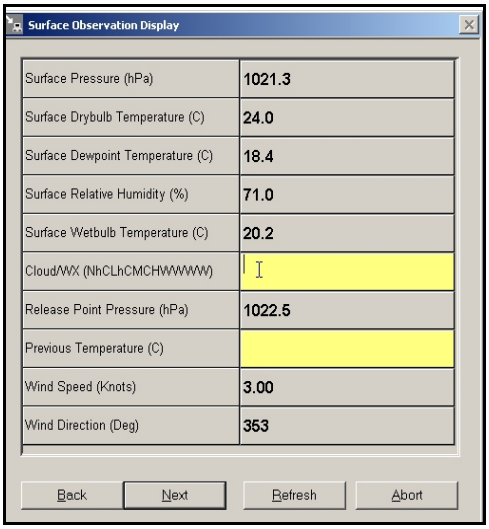


Exhibit 3-10 Surface Display After Refresh Prior to Cloud/WX Entry

12. Enter the Cloud/WX block with 009000101. The Previous Temperature is not required because the pressure is 1000 hPa or greater. (See Exhibit 3-11)

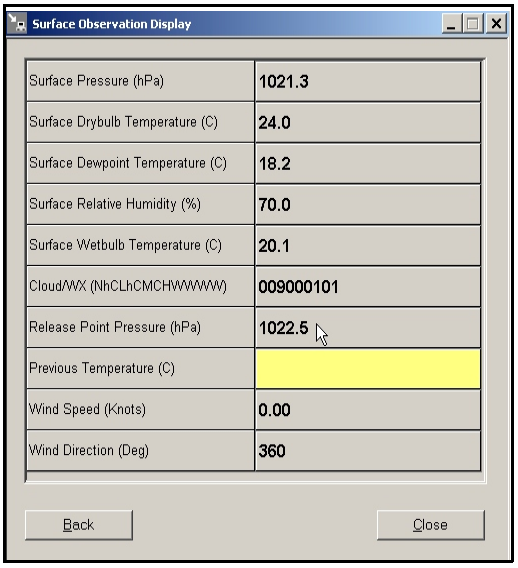


Exhibit 3-11 Surface Observation After Entering Clouds/WX

13. Click the "Next" button, the Antenna Orientation/TRS Display will come up. (See Exhibit 3-12) Position the antenna to the azimuth and elevation for radiosonde baseline. This is accomplished by filling in the proper entries into the Azimuth and Elevation blocks in the display and then clicking the Move Antenna button or by using the "Slewing" arrows.

Note: Azimuth indicates the direction the TRS antenna is pointing. (This is 180 degrees out from the old ART system.)

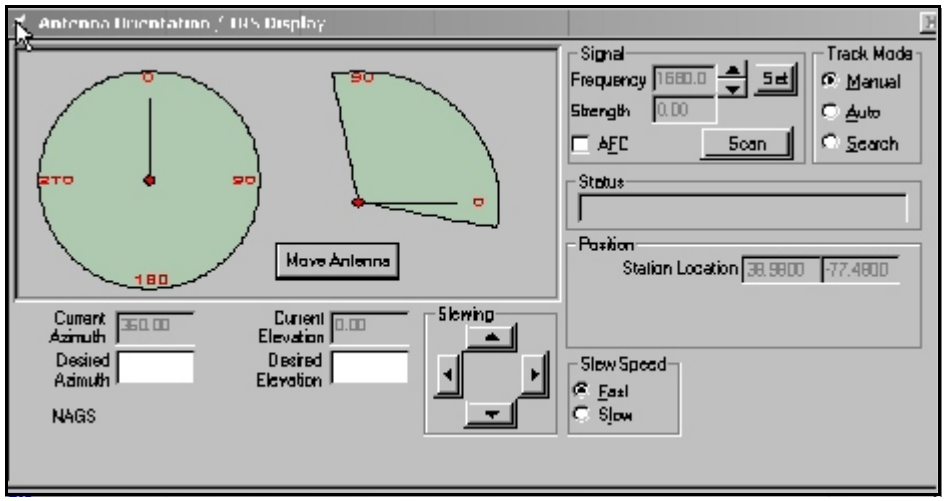


Exhibit 3-12 Antenna Orientation/TRS Display

14. Enter the azimuth and elevation desired. Remember this is a simulated flight, so these values are not critical. (See Exhibit 3-13)

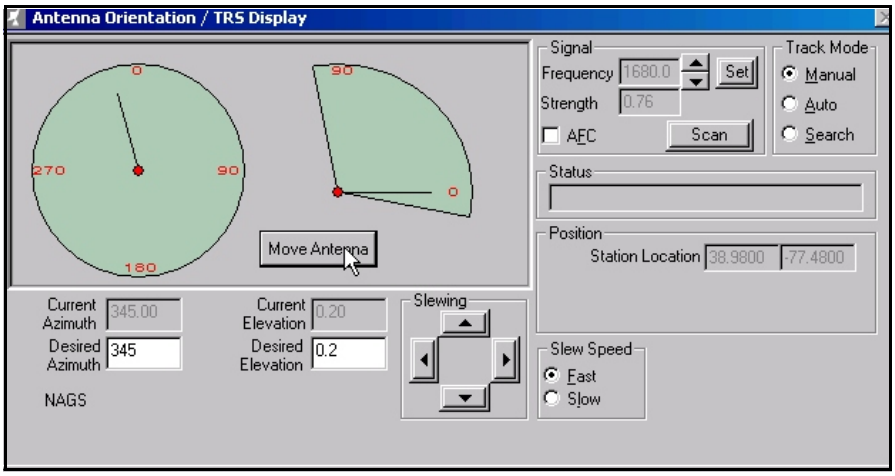


Exhibit 3-13 Antenna Orientation/TRS Display - Moved

15. During a Live Flight, the next step would be to set the frequency on the radiosonde. There are 4 possible frequencies to choose from. They are 1676, 1678, 1680 and 1682 MHz. The radiosonde default frequency is 1676 MHz. Prepare the instrument. ***Allow a minimum of 5 minutes warm-up time on the battery to ensure the battery is up to voltage and the pressure sensor has stabilized .*** In the Antenna Orientation/TRS Display press the Set button. Enter one of the four values and click the OK button. Once the frequency is located, ensure the AFC box is checked. (See Exhibit 3-14)

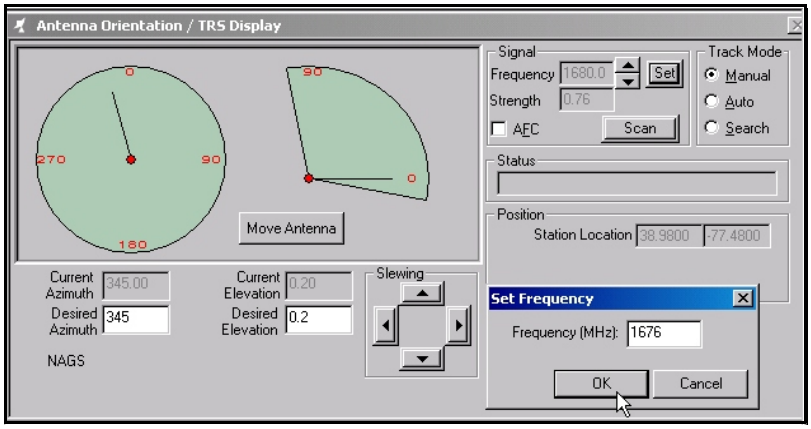


Exhibit 3-14 Setting Frequency

16. During the Live Flight mode, the frequency may be found by using the Scan button on the Antenna Orientation/TRS Display. The receiver will scan from 1668 to 1700 MHz and lock on to the strongest signal. (See Exhibit 3-15) This signal may be .1 or .2 MHz off one of the four frequencies, try to obtain the maximum signal strength. Normally a strength of at least 50 or higher. If the signal is less than 60, reposition the antenna to see if a stronger signal can be found. Ensure the AFC box is checked.

NOTE: ***Do not use the "Scan" button if doing a second or third release.*** The receiver may lock-on to the previous radiosonde and use the wrong calibration data at baseline.

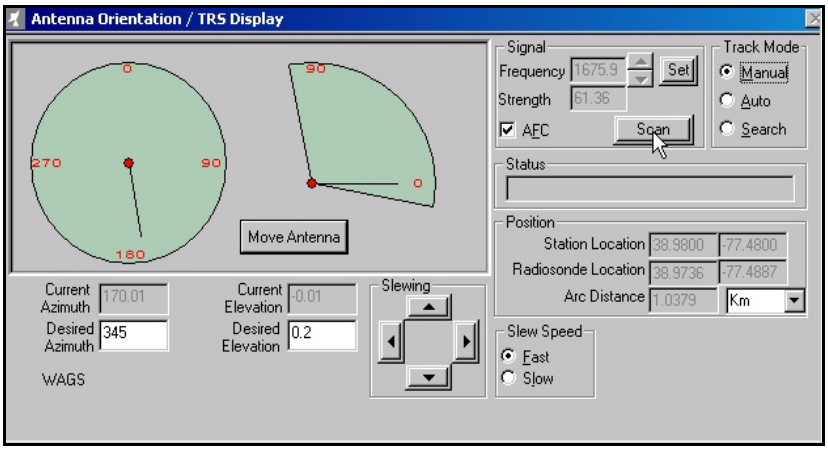


Exhibit 3-15 Scan Frequency for Strongest Signal

17. During the Live Flight mode, once the antenna has been positioned and the signal acquired, click the Next button on the Surface Observation Display. (See Exhibit 3-16)

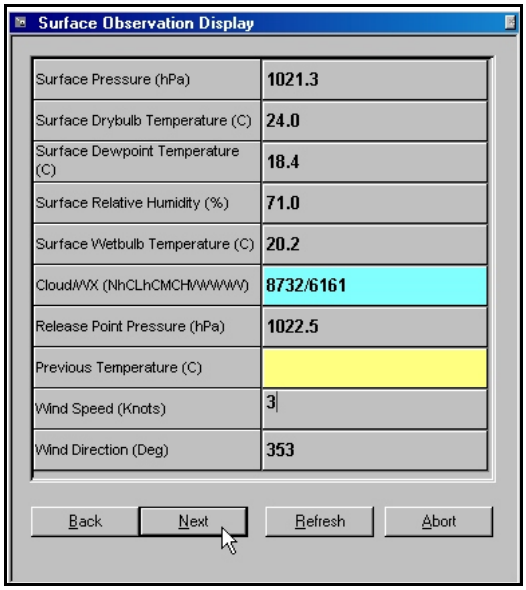


Exhibit 3-16 Surface Observation Display

NOTE: The Release Point Pressure is 1.2 hPa higher than the Surface Pressure. The release point height is 10 meters less than the baseline point. This can be verified in the Station Data Display and validated with the Pressure Correction Table.

18. The Baseline Display and the SPS Initialization windows appear. The SPS window will close at 100%. (See Exhibits 3-17 and 3-18)

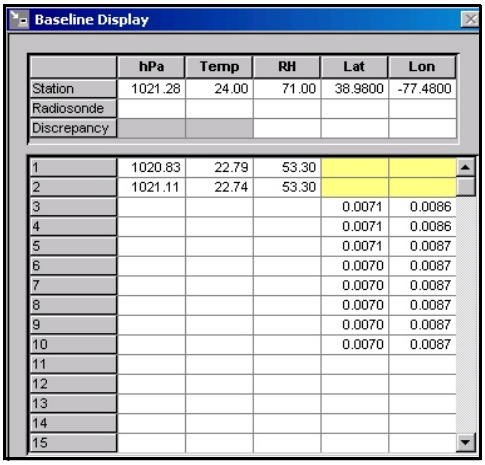


Exhibit 3-17 Start of Baseline

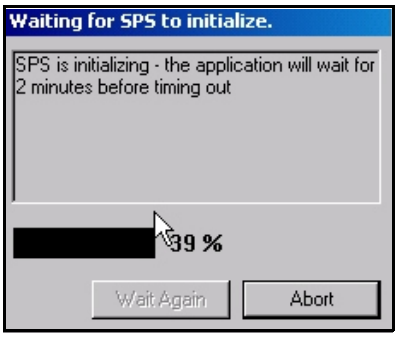
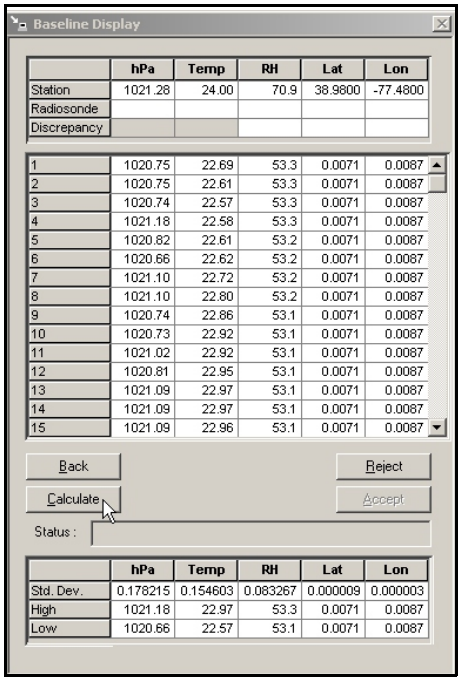


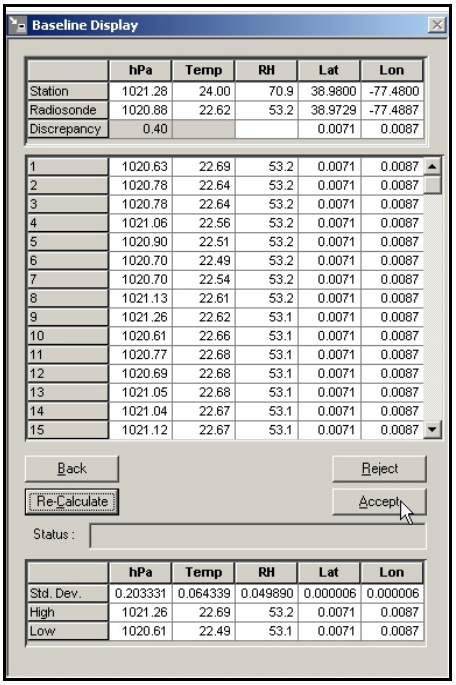
Exhibit 3-18 SPS Initialization

19. The Baseline Display will run. A minimum of 10 frames are required before one may click the Calculate button. Ensure the frames look consistent. The Pressure Discrepancy must be less than 5 hPa and the Temp and RH values should be reasonably close to the office conditions. (See Exhibit 3-19) Remember, there may be a significant difference between the surface sensors readings and the values inside the office where the instrument is located. If readings look reasonable, click the Accept button. (See Exhibit 3-20) If the readings are outside tolerance, go ahead and click the Re-Calculate button. If readings fail twice, click the Reject button. The Equipment Display will appear. Select another radiosonde.



	hPa	Temp	RH	Lat	Lon
Station	1021.28	24.00	70.9	38.9800	-77.4800
Radiosonde					
Discrepancy					
1	1020.75	22.69	53.3	0.0071	0.0087
2	1020.75	22.61	53.3	0.0071	0.0087
3	1020.74	22.57	53.3	0.0071	0.0087
4	1021.18	22.58	53.3	0.0071	0.0087
5	1020.82	22.61	53.2	0.0071	0.0087
6	1020.66	22.62	53.2	0.0071	0.0087
7	1021.10	22.72	53.2	0.0071	0.0087
8	1021.10	22.80	53.2	0.0071	0.0087
9	1020.74	22.86	53.1	0.0071	0.0087
10	1020.73	22.92	53.1	0.0071	0.0087
11	1021.02	22.92	53.1	0.0071	0.0087
12	1020.81	22.95	53.1	0.0071	0.0087
13	1021.09	22.97	53.1	0.0071	0.0087
14	1021.09	22.97	53.1	0.0071	0.0087
15	1021.09	22.96	53.1	0.0071	0.0087
Std. Dev.	0.178215	0.154603	0.083267	0.000009	0.000003
High	1021.18	22.97	53.3	0.0071	0.0087
Low	1020.66	22.57	53.1	0.0071	0.0087

Exhibit 3-19 Baseline Complete



	hPa	Temp	RH	Lat	Lon
Station	1021.28	24.00	70.9	38.9800	-77.4800
Radiosonde	1020.88	22.62	53.2	38.9729	-77.4887
Discrepancy	0.40			0.0071	0.0087
1	1020.63	22.69	53.2	0.0071	0.0087
2	1020.78	22.64	53.2	0.0071	0.0087
3	1020.78	22.64	53.2	0.0071	0.0087
4	1021.06	22.56	53.2	0.0071	0.0087
5	1020.90	22.51	53.2	0.0071	0.0087
6	1020.70	22.49	53.2	0.0071	0.0087
7	1020.70	22.54	53.2	0.0071	0.0087
8	1021.13	22.61	53.2	0.0071	0.0087
9	1021.26	22.62	53.1	0.0071	0.0087
10	1020.61	22.66	53.1	0.0071	0.0087
11	1020.77	22.68	53.1	0.0071	0.0087
12	1020.69	22.68	53.1	0.0071	0.0087
13	1021.05	22.68	53.1	0.0071	0.0087
14	1021.04	22.67	53.1	0.0071	0.0087
15	1021.12	22.67	53.1	0.0071	0.0087
Std. Dev.	0.203331	0.064339	0.049890	0.000006	0.000006
High	1021.26	22.69	53.2	0.0071	0.0087
Low	1020.61	22.49	53.1	0.0071	0.0087

Exhibit 3-20 Baseline Accepted

20. Once the baseline has been accepted, a window will appear asking if you would like to continue. Click the Yes button. (See Exhibit 3-21)

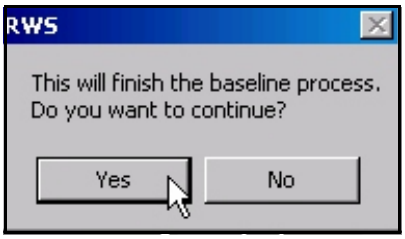


Exhibit 3-21

21. The GPS Status Window should re-appear and be updating. (See Exhibit 3-22) Shortly thereafter the Waiting for Balloon Release Display appears. (See Exhibit 3-24) Because this is a simulated flight no matches of GPS lock is shown in the GPS Status window. Typically expect to see at least 6 matches in this window during a live flight.

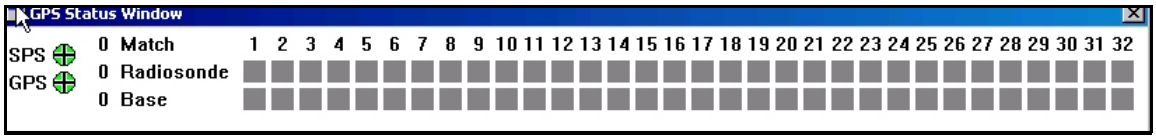


Exhibit 3-22 GPS Status Window

22. After Baseline is concluded the observer should monitor the "Status Bar" at the bottom of the screen to ensure the radiosonde sensors are working properly prior to leaving the office to go to the inflation building. This is a key tool. It should not be overlooked (See Exhibit 3-23)

Exhibit 3-23 Status Bar with Current Radiosonde PTU Values

NOTE: During a live flight, the TRS Antenna would be positioned to face the direction the balloon is expected to travel. The motors would be left in "Manual" tracking mode until the instrument is released. Using the CDU at the release point, the antenna should be placed in the "Auto" track mode after release and the signal strength and frequency verified. Signal strength on the CDU should be between -60 to 0 dBm to enable "Auto" track.

23. To simulate a release, click on the Icon with the Yellow Balloon. (See Exhibit 3-25) The Waiting for Balloon Release Display will disappear and be replaced by the Release Detected Display.

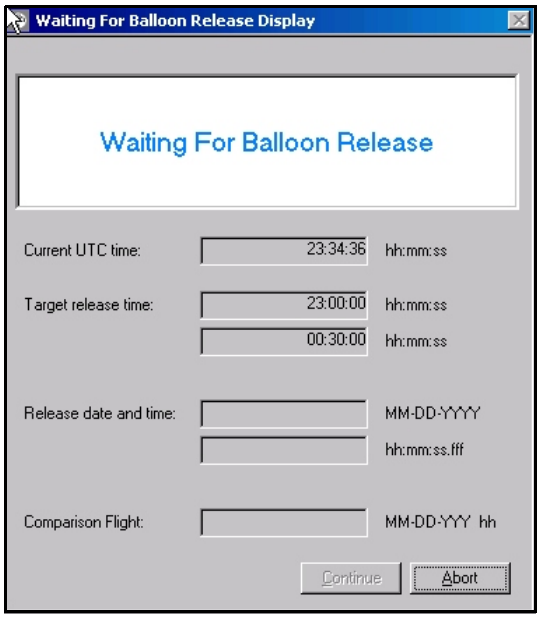


Exhibit 3-24 Waiting for Balloon Release

Exhibit 3-25 Simulate Release

24. Once the Balloon Release Detected Display comes up, go ahead and click Continue to move forward into the flight. (See Exhibit 3-26)

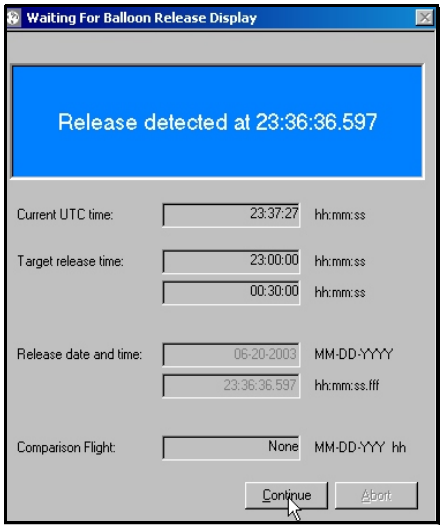


Exhibit 3-26 Release Detected

3.2.2 In-Flight Procedures

1. The Surface Observation Display appears with the Surface Observation input during Pre-Release and at Release. (See Exhibit 3-27) The software will use the release information. The operator may edit any block in the release portion, or hit the Refresh button. Clicking OK will place the changes in the Release section of the display into the data shown at release or at 0.0 minutes of the flight.

NOTE: Recheck the Cloud Data for accuracy. The Solar Radiation Correction is derived from the Cloud Data. It significantly impacts the RADAT and Coded Messages. **Re-validating the Surface Observations should normally be the first task performed after release.**

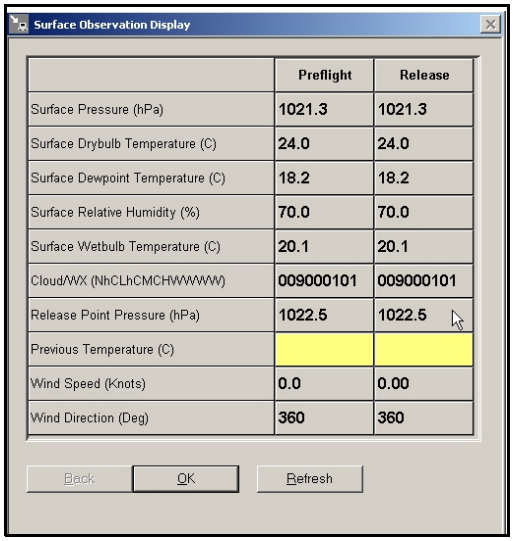


Exhibit 3-27 Surface Observation

2. At the same time the Surface Observation Display appears, the Status Message Display also appears with the Balloon Detection Message on the last line. (See Exhibit 3-28)

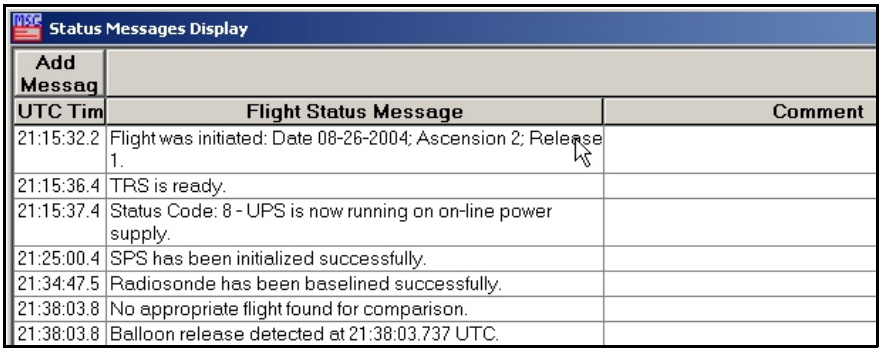


Exhibit 3-28 Balloon Release Detected

3. Any windows not grayed out may be opened. There are a few windows which are preferable to open after release to ensure the flight is proceeding and to make any necessary adjustments. These are:

Antenna Orientation/TRS Display	**Received PTU**	**GPS Status**
Temperature-RH Plot	**Wind Plot**	

NOTE: Displays and plots may be called up and viewed simultaneously by selecting Tile under the Windows option. (See Exhibit 3-29)

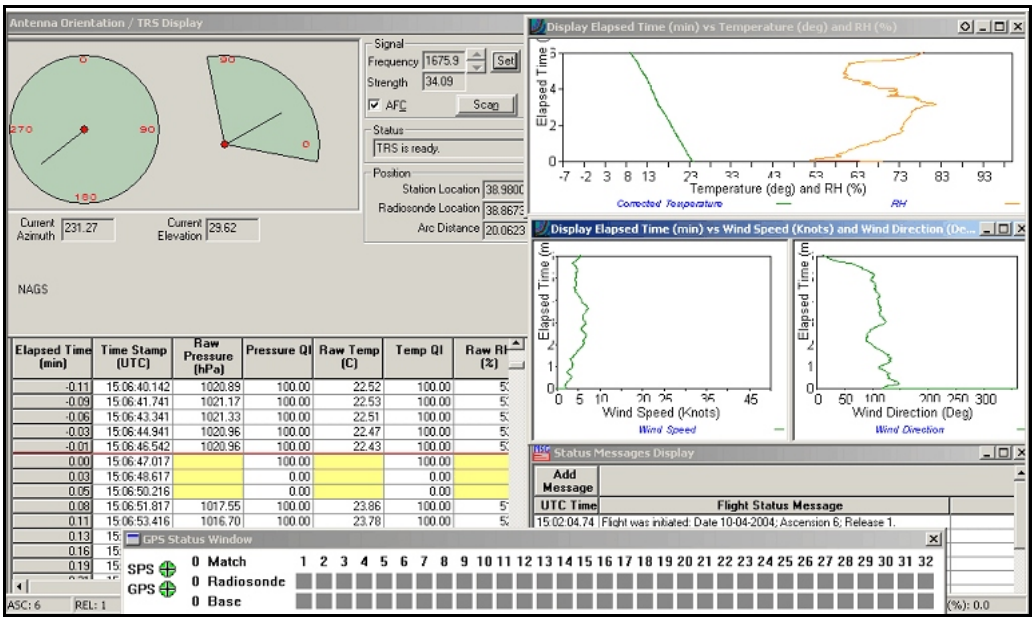


Exhibit 3-29 Initial Displays and Plots to View After Release

4. The Antenna Orientation/TRS Display is probably the most essential display to first view. (See Exhibit 3-30) This display allows the operator to verify that a strong signal is being received and if not allows the observer to take corrective action by either manually moving the antenna, setting the frequency, or using the search and scan modes.

NOTE: If the signal strength box drops below 14, the antenna will not track properly.

If the antenna has not alarmed and gone into the "Limited Search" mode. Place the antenna in "Search". If the instrument is not found by the "Limited Search" mode, type in the Azimuth and Elevation of the last known points from the last good data in the Azimuth and Elevation plots. Click the "Search" button. Monitor the Antenna/TRS Display for increases in signal strength.

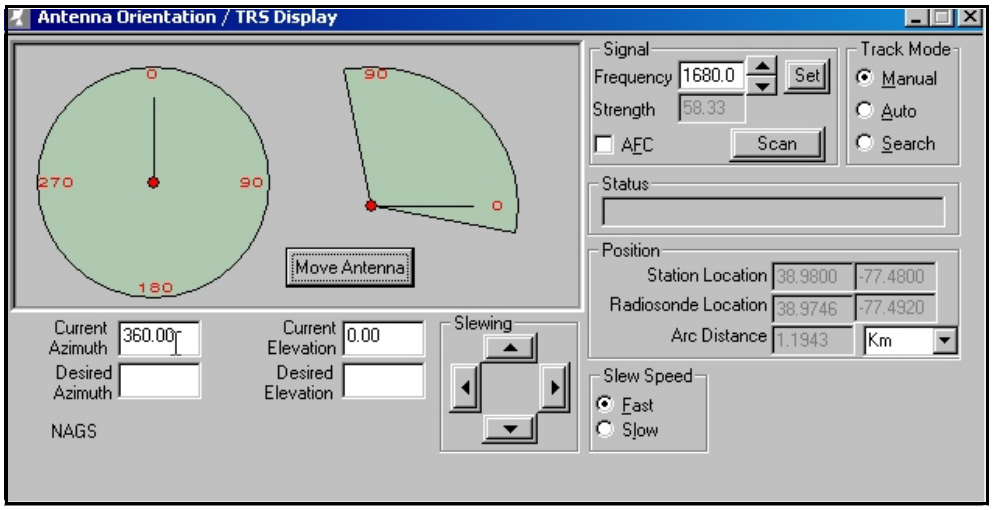


Exhibit 3-30 Antenna Orientation/TRS Display

5. **Validating the release point is correct is typically the second operator task that should be performed after release.** The Raw PTU Tabular Display and Processed Tabular Display are windows that need to be viewed shortly after release to verify that the correct time of release was picked by the software. (See Exhibits 3-31 and 3-32) Looking at the Geopotential Height at 0.0 minutes and comparing it to the first data point is a sure way to determine if the established station height is at 0.0 minutes and verify that the first data point above the surface shows a height increase.

Elapsed Time (min)	Time Stamp (UTC)	Raw Pressure (hPa)	Pressure QI	Raw Temp (C)	Temp QI
-0.11	15:06:40.142	1020.89	100.00	22.52	100.00
-0.09	15:06:41.741	1021.17	100.00	22.53	100.00
-0.06	15:06:43.341	1021.33	100.00	22.51	100.00
-0.03	15:06:44.941	1020.96	100.00	22.47	100.00
-0.01	15:06:46.542	1020.96	100.00	22.43	100.00
0.00	15:06:47.017		100.00		100.00
0.03	15:06:48.617		0.00		0.00
0.05	15:06:50.216		0.00		0.00
0.08	15:06:51.817	1017.55	100.00	23.86	100.00
0.11	15:06:53.416	1016.70	100.00	23.78	100.00

Exhibit 3-31 Raw PTU Tabular Data at Release

NOTE: Less than 1-minute of consecutive Raw Data Points will be interpolated in the Processed Tabular Display.

Processed Tabular Display

Elapsed Time (Minutes)	Time Stamp (UTC)	Corrected Pressure (hPa)	Smoothed Pressure (hPa)	Geopotential Height	Corrected Temperature
0.00	22:22:48	1022.48	1022.48	75	24.00
0.02	22:22:49	1021.79	1021.62	82	23.91
0.03	22:22:50	1020.76	1020.70	90	23.89

Exhibit 3-32 Validating Height Increase Off Surface

6. The SPS/GPS Status Window is another display that should be viewed to ensure wind computation is being performed. (See Exhibit 3-32) This window for the simulated flight shows no matches, but in a live flight typically 6-10 matches can be expected.

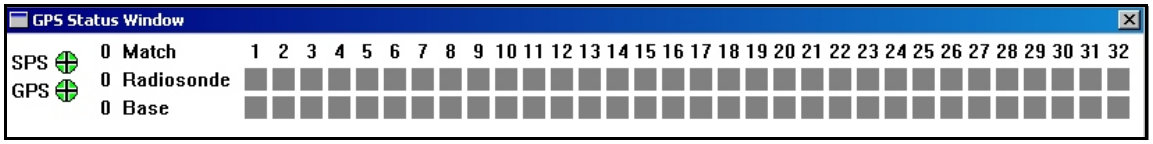


Exhibit 3-32 SPS/GPS Status Window

NOTE: Green SPS Icon - Indicates PTU being received
Green GPS Icon - Indicates Wind Data being received

7. The Temperature-RH Plot also provides a means to ensure the Temperature and RH trend lines look reasonable. (See Exhibit 3-33) Any abrupt deviation in the trend lines should be verified for accuracy. If the data is bad, the operator must go in and delete or edit the data in question by marking the Processed Data Set (PDS).

.

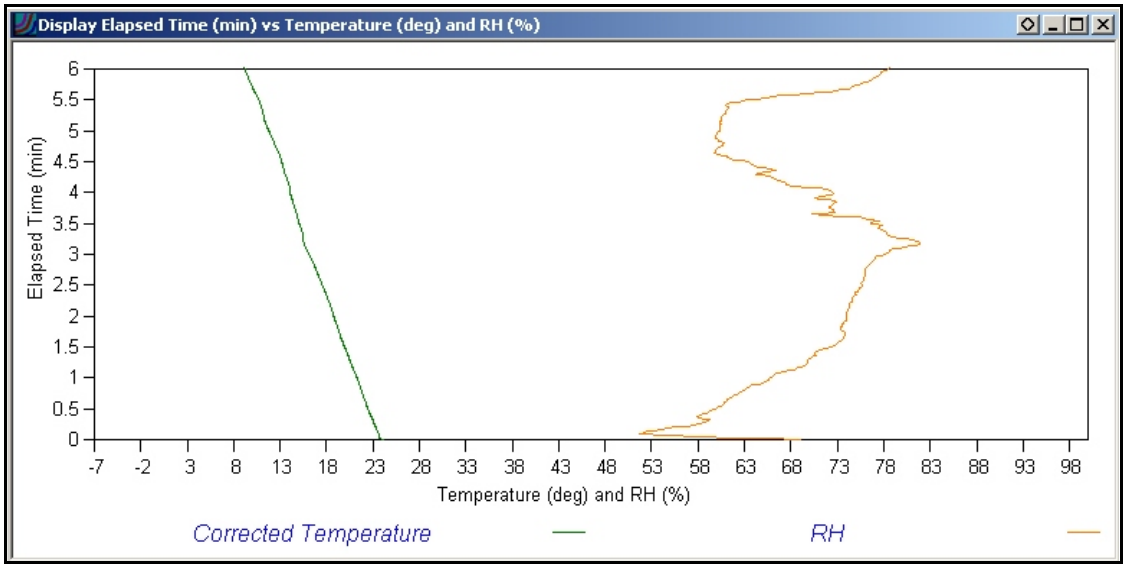


Exhibit 3-33 Temperature/RH Plot

8. If there is questionable data or possibly bad data a closer look is desired. Zoom in on the area by clicking and holding the left mouse button, while dragging over the area of interest. (See Exhibit 3-34

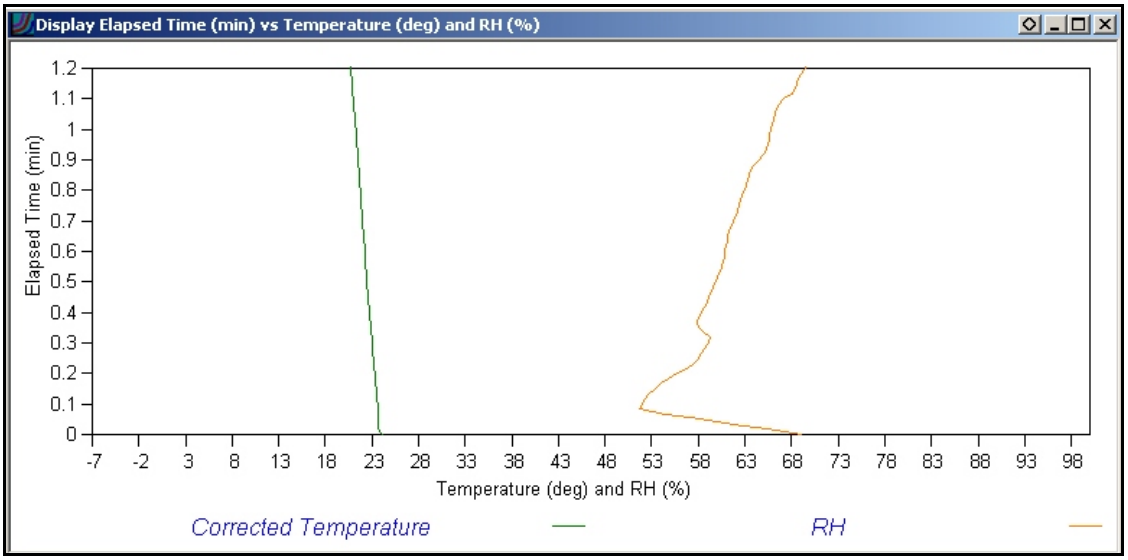


Exhibit 3-34 Expanded Temp/RH Plot Near Surface

9. Wind Plot is another useful tool for verifying wind accuracy with a quick look at the profile for continuity or realism. The zoom feature may be used or the Scale option to increase the size of a given area of concern. (See Exhibit 3-35)

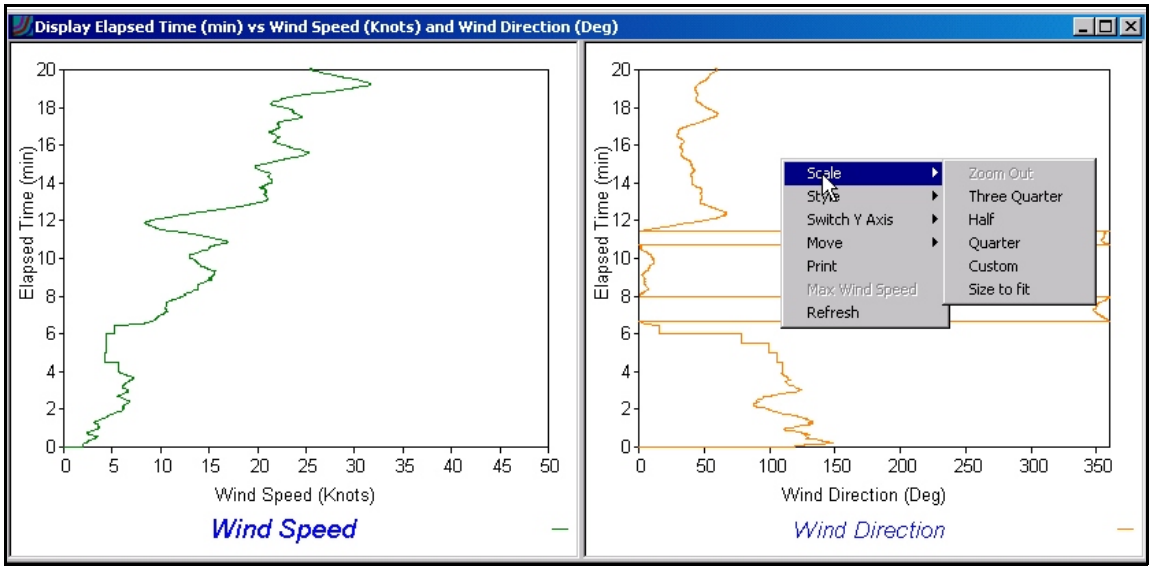


Exhibit 3-35 Wind Speed and Direction Plot

10. Looking at the tabular data is the next logical step after viewing a plot and finding data that may need attention. Go to the top of the RWS Main Window and select Tables and click on Processed. Once the Processed Data Display appears, move the cursor to the far right part of the display and right click to elect a scroll option. (See Exhibit 3-36)

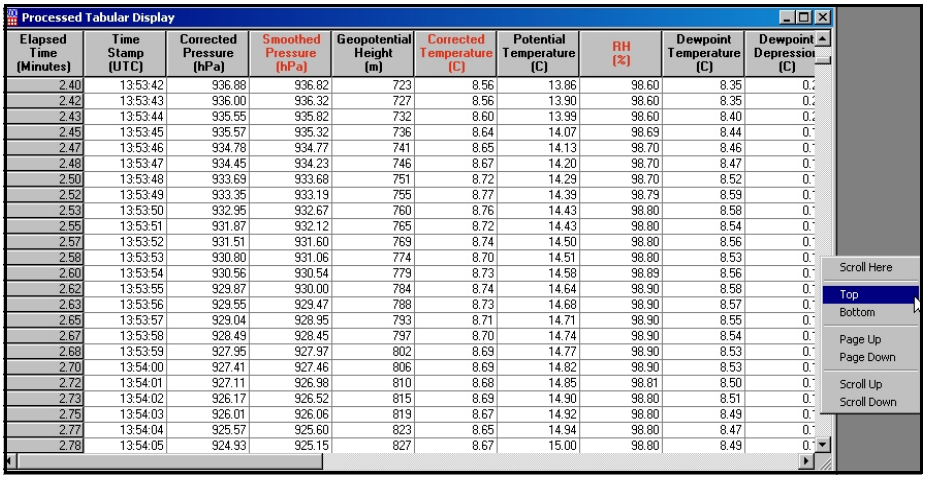
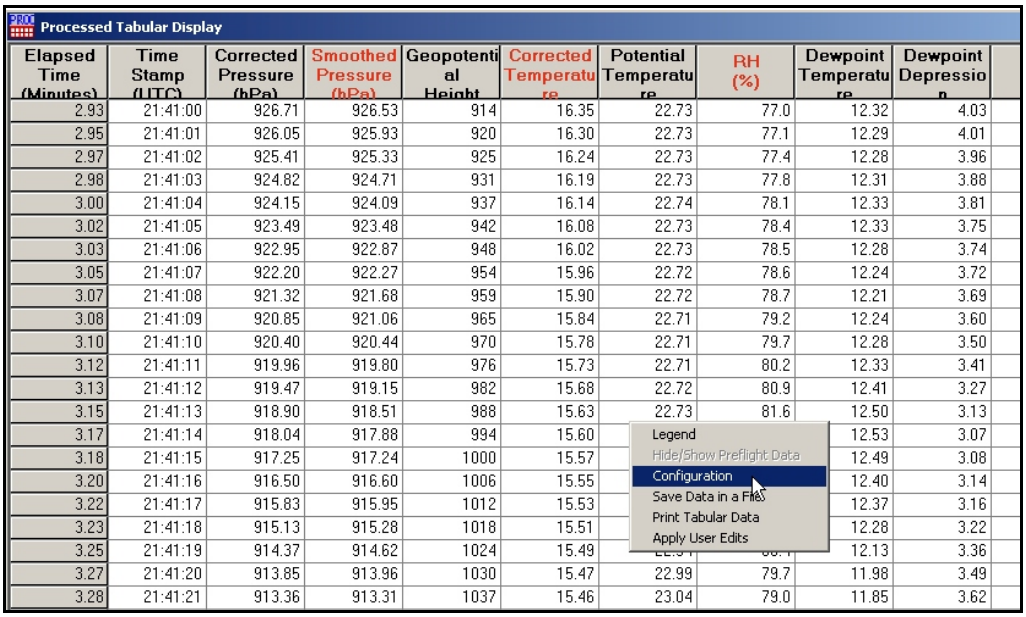


Exhibit 3-36 Processed Tabular Display with Scroll Options

11. The Processed Data Display may be configured to show only certain parameters and also have the data points spaced at a greater time interval than 1 per second. Move the cursor inside the Processed Tabular Display and right click and select Configuration. All of these options can make data editing and marking an easier task. (See Exhibit 3-37)

NOTE: Data may not be "Marked" in data intervals greater than 1 second.



Elapsed Time (Minutes)	Time Stamp (UTC)	Corrected Pressure (hPa)	Smoothed Pressure (hPa)	Geopotential Height	Corrected Temperature	Potential Temperature	RH (%)	Dewpoint Temperature	Dewpoint Depression
2.93	21:41:00	926.71	926.53	914	16.35	22.73	77.0	12.32	4.03
2.95	21:41:01	926.05	925.93	920	16.30	22.73	77.1	12.29	4.01
2.97	21:41:02	925.41	925.33	925	16.24	22.73	77.4	12.28	3.96
2.98	21:41:03	924.82	924.71	931	16.19	22.73	77.8	12.31	3.88
3.00	21:41:04	924.15	924.09	937	16.14	22.74	78.1	12.33	3.81
3.02	21:41:05	923.49	923.48	942	16.08	22.73	78.4	12.33	3.75
3.03	21:41:06	922.95	922.87	948	16.02	22.73	78.5	12.28	3.74
3.05	21:41:07	922.20	922.27	954	15.96	22.72	78.6	12.24	3.72
3.07	21:41:08	921.32	921.68	959	15.90	22.72	78.7	12.21	3.69
3.08	21:41:09	920.85	921.06	965	15.84	22.71	79.2	12.24	3.60
3.10	21:41:10	920.40	920.44	970	15.78	22.71	79.7	12.28	3.50
3.12	21:41:11	919.96	919.80	976	15.73	22.71	80.2	12.33	3.41
3.13	21:41:12	919.47	919.15	982	15.68	22.72	80.9	12.41	3.27
3.15	21:41:13	918.90	918.51	988	15.63	22.73	81.6	12.50	3.13
3.17	21:41:14	918.04	917.88	994	15.60			12.53	3.07
3.18	21:41:15	917.25	917.24	1000	15.57			12.49	3.08
3.20	21:41:16	916.50	916.60	1006	15.55			12.40	3.14
3.22	21:41:17	915.83	915.95	1012	15.53			12.37	3.16
3.23	21:41:18	915.13	915.28	1018	15.51			12.28	3.22
3.25	21:41:19	914.37	914.62	1024	15.49			12.13	3.36
3.27	21:41:20	913.85	913.96	1030	15.47	22.99	79.7	11.98	3.49
3.28	21:41:21	913.36	913.31	1037	15.46	23.04	79.0	11.85	3.62

Exhibit 3-37 Configuring Processed Tabular Display

12. Here are the Configuration options that may be checked or unchecked with a click of the mouse button. A different time interval may be entered for data point selection. (See Exhibit 3-38)

NOTE: Only columns titled in "Red" may be marked or edited.

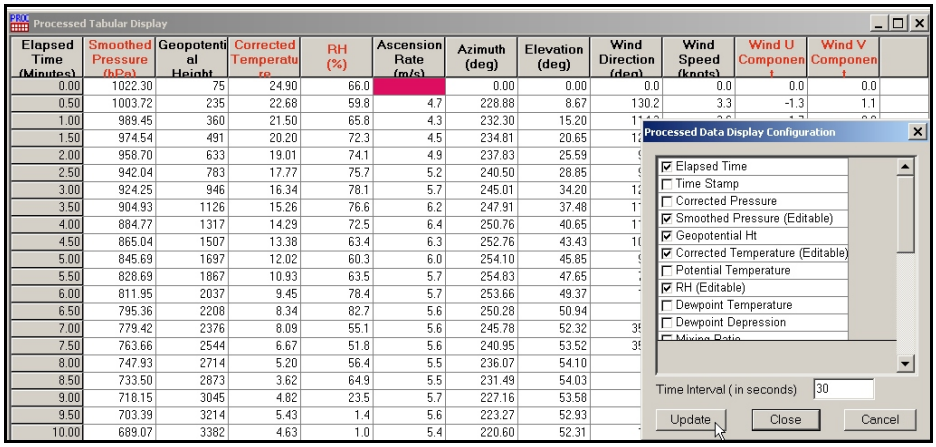


Exhibit 3-38 Configuration Option with Processed Data Display

13. Marking data requires a left click on the appropriate columns in which changes are desired. If data is bad or questionable, click on the appropriate column and drag over the desired interval of time to mark the data. Finally, right click inside the window and click on Apply User Edits. (See Exhibit 3-39) After the edits are completed, if a need to adjust or unmark some of the data, click on the appropriate area or areas, the color should change blue back to white. Then click on Apply User Edits. Data marked for less than a minute will be interpolated.

NOTE: Marking data should be done after verifying the Surface Observation and Release Point. **This is the 3rd operator task typically performed**. All data marking will be lost if the Surface Observation or Release Point is changed after marking data.

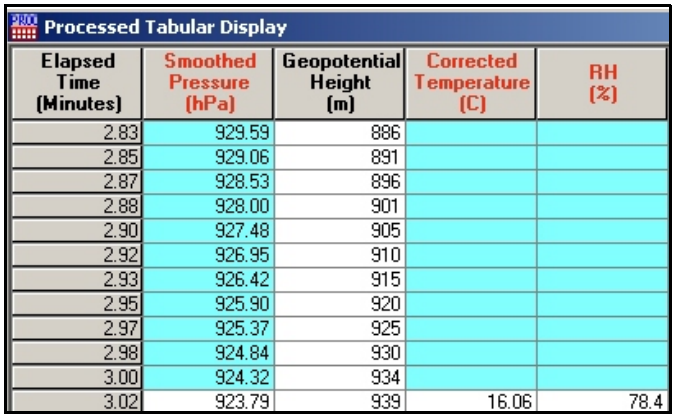


Exhibit 3-39 Marking All Data

14. Go to the top of the RWS Screen display and select Plots. Under the Plots select the Temperature Plot. Exhibit 3-40 reflects the changes to the Processed Data Set when marking Temperature and RH data from 8.0 to 11.0 minutes.

NOTE: When more than 1 minute is marked, the plotted and tabular data will be made missing. However, missing data will not be reflected in the coded messages unless a 20 hPa thickness of PTU or 1500 meters of position data is missing.

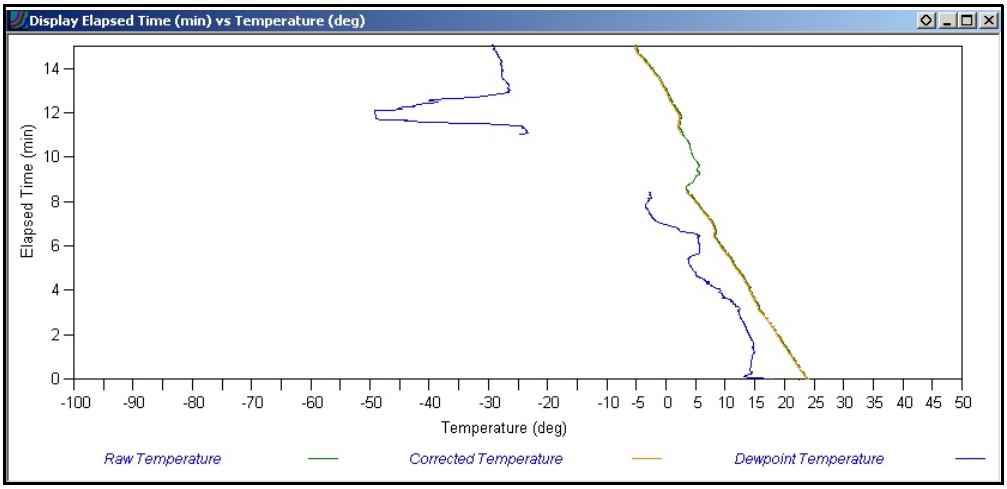


Exhibit 3-40 Temperature plot with Deleted Data

15. You may wish to mark all the editable data. This can be accomplished by clicking and dragging on the Elapsed Time Column of the Processed Tabular Data Display. (See Exhibit 3-41)

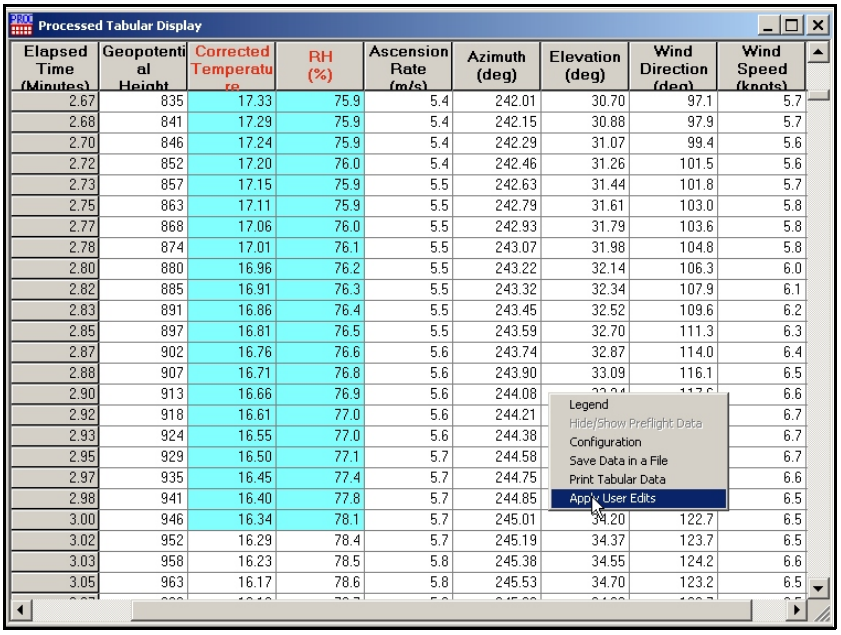


Exhibit 3-41 Marked Processed Data from 1 to 3 Minutes

16. Exhibit 3-42 is the subsequent Temperature and RH Plot with the missing data from minute 1 to 3 minutes that was marked missing from Exhibit 3-41.

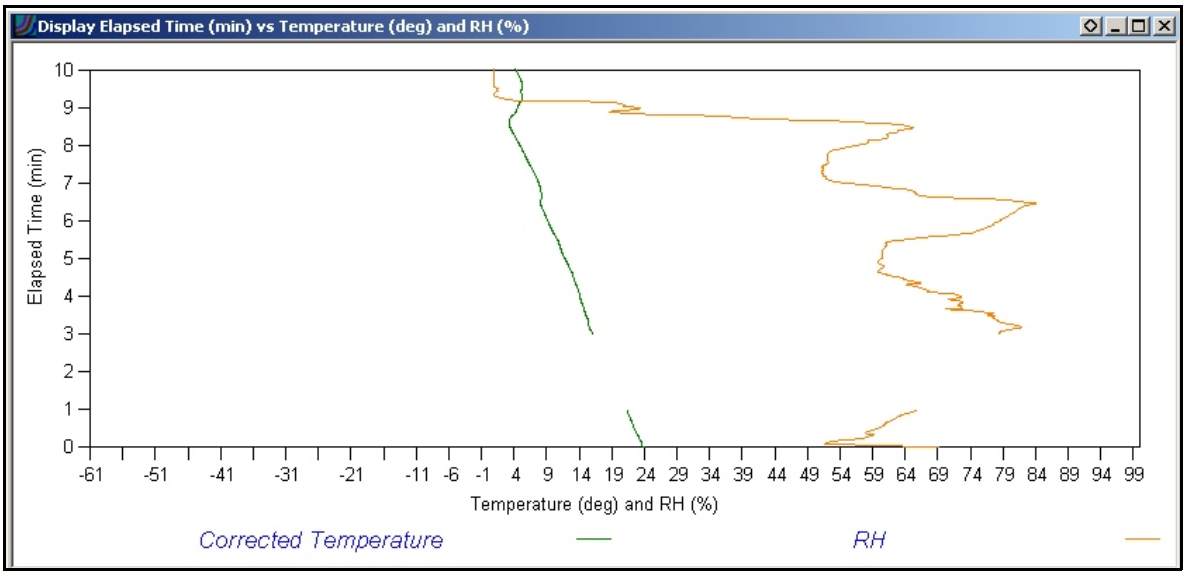


Exhibit 3-42 Temperature and RH Deleted from Minute 1 to Minute 3

17. Besides using the plot displays, the Check and Status Messages may provide assistance in finding areas of the flight that have questionable or bad data. The Check Messages are designed to alert the operator of unusual or abnormal flight occurrences. (See Exhibit 3-43) The Check and Status Messages however do not catch all flight problems and the operator must use these alerts in conjunction with the plots and other tools such as signal strength to determine data quality.

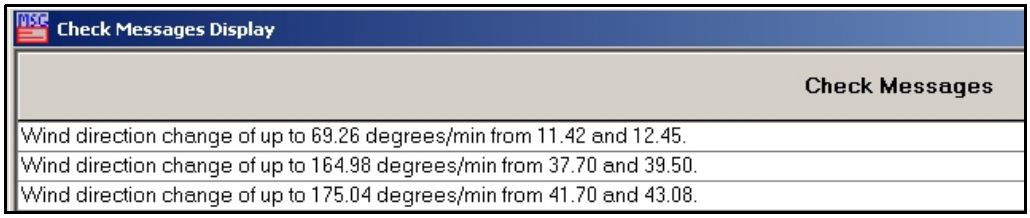


Exhibit 3-43 Check Messages

18. Status Messages provide information on flight events. (See Exhibit 3-44) There are some Status Messages such as Balloon Descending and Re-ascending Messages that alert the observer that a closer look at the data is required to determine if some data must be edited or deleted.

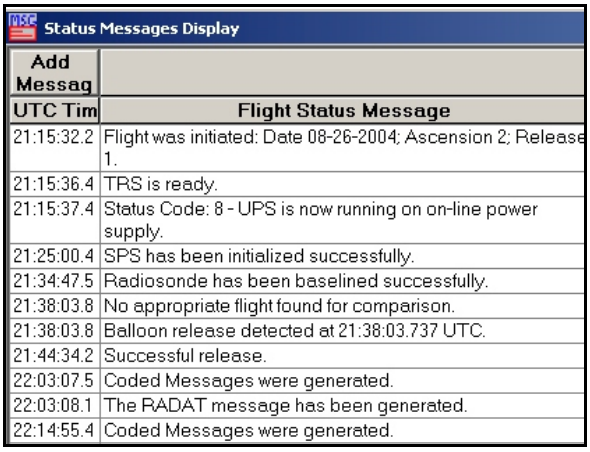


Exhibit 3-44 Status Messages

19. The Coded Messages are automatically coded at 400 hPa for RADAT, 70 hPa for TTAA, TTBB, and PPBB Messages and at Flight Termination for TTCC, TTDD, and PPDD. The observer may also initiate the Code command at anytime during the flight by selecting "Code" under the "Messages" option.

Transmitting Messages: In the upper left window of the display click the left mouse button in the small block to put a check mark in the box next to the message to be transmitted. (See Exhibit 3-45) Click on the Transmit button at the bottom of the display to send the message(s).

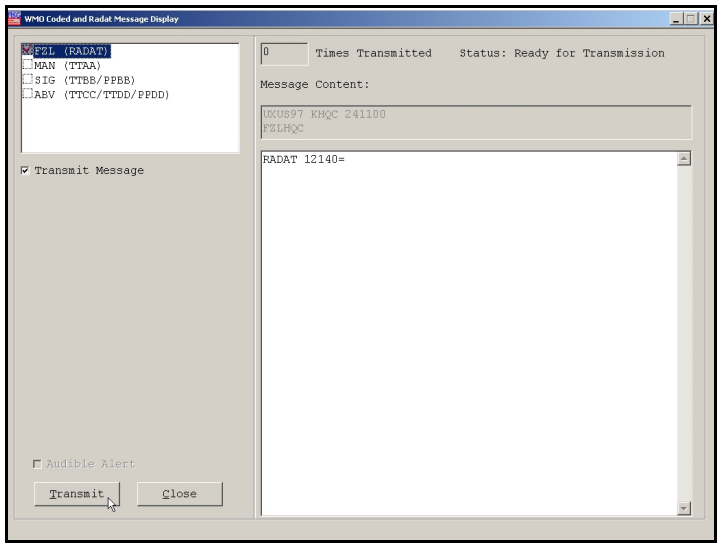


Exhibit 3-45 RADAT Message

20. The MAN (TTAA), SIG (TTBB and PPBB), and the ABV (TTCC, TTDD, and PPDD) may be coded, however message editing and transmission is not allowed during the simulated flight. During Live Flight and Rework groups may be added or deleted within the messages by placing the cursor over the area, left clicking and add or delete the desired data using the keyboard. Exhibit 3-46 shows examples of partial MAN and SIG messages. Chapter 10 provides more detailed information on groups within the coded messages.

```
69003 TTAA  74014 69003 99022 24056 00000 00269 22458 12503
92941 16439 12007 85656 12458 10004 70255 05699 01014 50592
11577 05523 40759 24778 06029 88999 77999 31313 08708 80031
51515 10159 10164 00007 10194 11005 01008=
```

```
69003 TTBB  74010 69003 00022 24056 11018 23861 22974 20050
33919 15831 44918 15831 55861 13058 66860 13058 77838 11457
88831 11057 99823 10244 11799 08428 22796 08225 33791 08456
44778 08059 55776 07859 66753 05659 77733 03656 88722 04471
99715 05071 11712 05489 22711 05695 33709 05699 44700 05499
55674 04099 66659 02676 77654 02276 88643 02499 99640 02499
11622 00890 22611 00276 33609 00076 44569 04774 55563 04974
66540 06777 31313 08708 80031 41414 00900 51515 10159=

PPBB  74010 69003 90012 00000 12502 10506 90346 12007 11507
08505 90789 00507 34511 36012 91123 01014 35517 35512 91468
04520 04021 03022 919// 06024 92012 04523 04530 06528 925//
06530=
```

Exhibit 3-46 Partial MAN and SIG Coded Messages

21. One tool or display that may be of use especially during flights where winds are changing abruptly is the Trajectory Plot.
(See Exhibit 3-47)

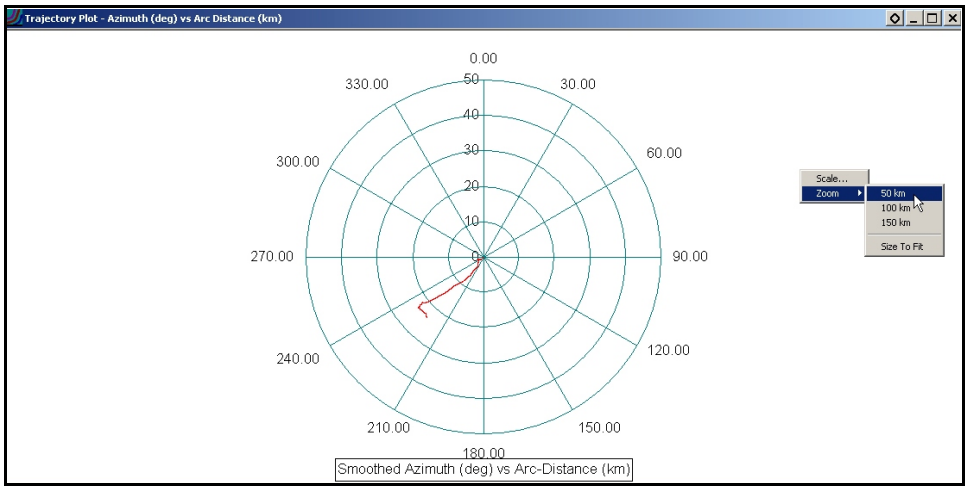


Exhibit 3-47 Trajectory Plot with Zoom Option

22. Another valuable tool for gathering flight information during and especially after the flight is concluded is the Flight Summary. Go to the View option at the top of the RWS Main window and select Flight Summary. (See Exhibit 3-48)

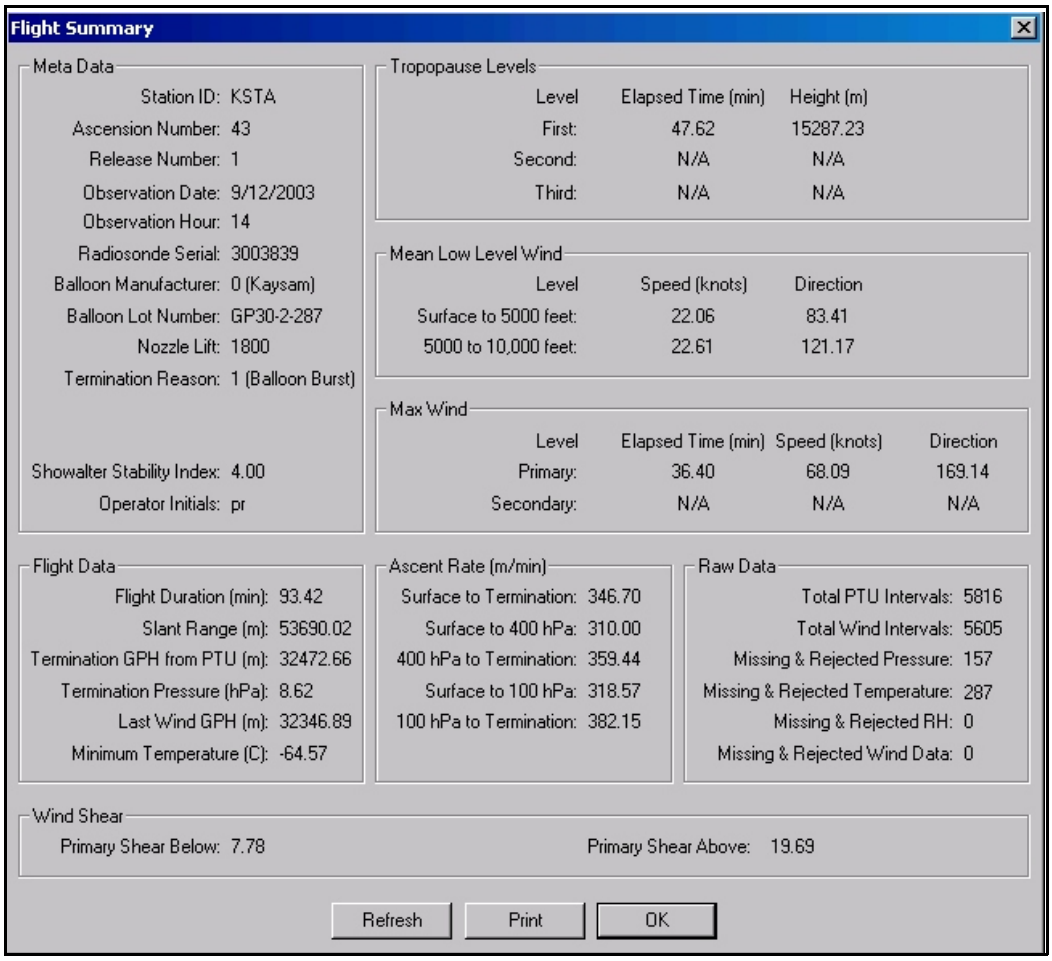


Exhibit 3-48 Flight Summary Display

23. The operator has the flexibility with the software to configure the data and the screen to display whatever they desire in the options available. Experiment with the displays and their options and also utilize the Tile option in the Windows option at the top of the RWS Main window. (See Exhibit 3-49)

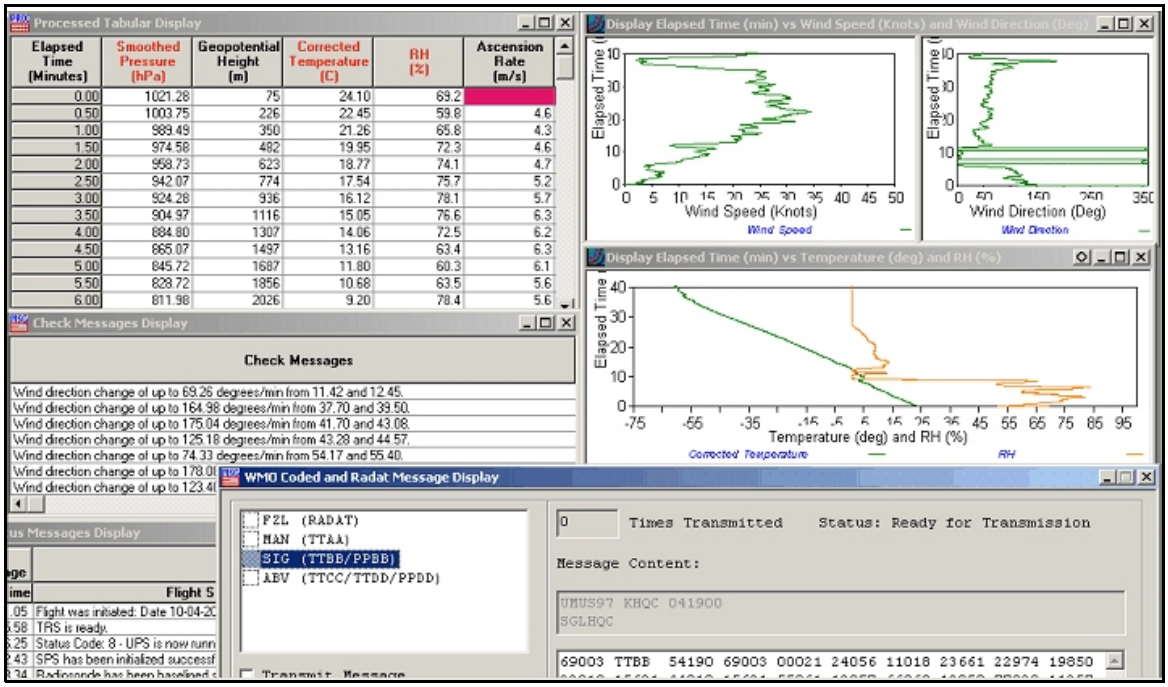


Exhibit 3-49 Tiled Displays and Plots Selected by Observer

3.2.3 Flight Termination

Algorithms have been written for the software to detect termination and determine a reason for termination. The operator may terminate the flight prior to the software termination. Once the software determines termination, the operator may go in and change the point of termination or the termination reason. This may be accomplished by clicking on "Tools" and selecting the appropriate option, either " Termination Time" or "Termination Reason". **Validating the Termination Time and Reason if the 4th and final major operator task that should normally be performed.**

NOTE: The observer may not change the termination time later than the time determined by the software.

3.2.4 In-flight and Post Flight Data Quality

It is important to remember there are four basic operator tasks to ensure data quality. They should normally be performed in order to ensure changes are saved. First, validate Surface Observation, then verify Release Point was selected correctly, third Mark Data if needed. Finally, validate Termination Time and Reason.

4. Rework - Overview of Operations

4.1 Introduction

This chapter provides instructions for the Rework and some of the Simulated Flight functions of RRS. It also provides examples of options and windows available to the user. Rework is used for several reasons. Some of the most common reasons are:

a. To correct data after a flight has been completed.
b. Quality control observations and operator performance.
c. Provide operator training.
d. Send corrected message within 6 hours of observation termination time.

Rework contains most of the capabilities for displaying and editing data that are available in the Live Flight option of RRS, which is used during an actual observation. Learning to use Rework with data from a stored flight will allow you to become familiar with many RRS features before you take an actual observation.

Before you begin training in Rework, you should have a basic knowledge of using a personal computer and gained some basic knowledge of the RRS System from reading Chapter 2 of this training guide.

4.2 Rework - Prerelease and In-Flight Display Introduction

Before the radiosonde is released, information about the flight must be supplied to RRS. In this chapter you will see an example of these Pre-release displays. You will also be introduced to the various windows and options available during in-flight operations.

NOTE: The Baseline Display and Waiting for Balloon Release Display can not be viewed in Rework.

4.2.1 Getting Started

1. Turn on the RRS workstation and log in using your assigned Username and Password.

2. The RWS Window will appear with the Security Warning message. Read the message and click on the OK button. (See Exhibit 4-2)

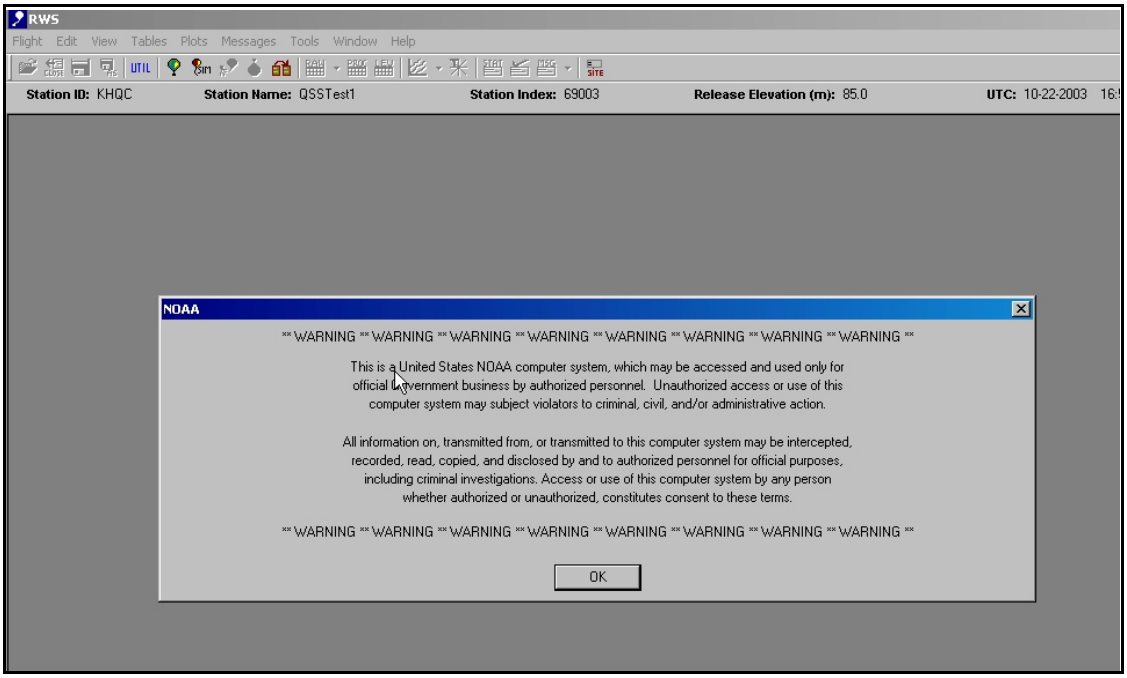


Exhibit 4-2 RWS Window with Security Warning Message

3. Flight Options Window appears. (See Exhibit 4-3) Select Perform Rework Option.

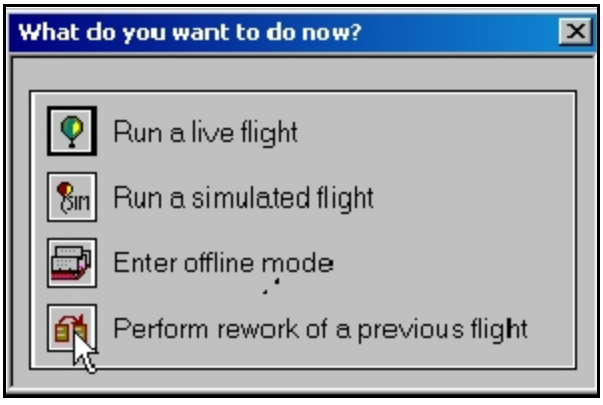


Exhibit 4-3 Flight Options

4. Previous Flight Window appears. (See Exhibit 4-4) Select flight to Rework and click OK button.

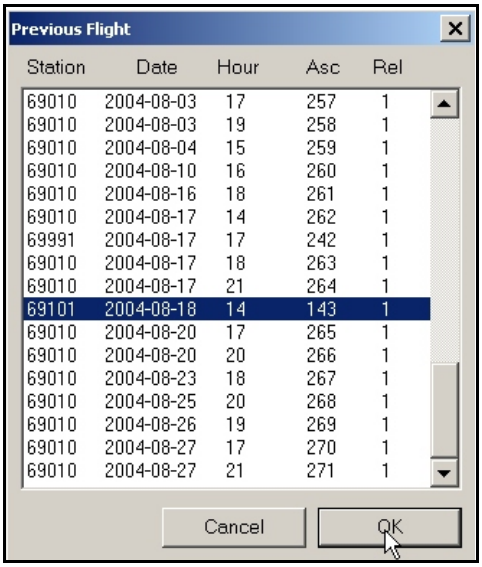


Exhibit 4-4 Flight Options

NOTE: The RWS software allows a site to view and Rework flights from other sites. Normally, the Previous Flight window will contain only flights from your site.

5. Click on the appropriate selection to Rework the flight using your current station data or if the flight is from another site, you may wish to use its station data to replicate the flight as the other site observed it. Then click on the Continue button. (See Exhibit 4-5)

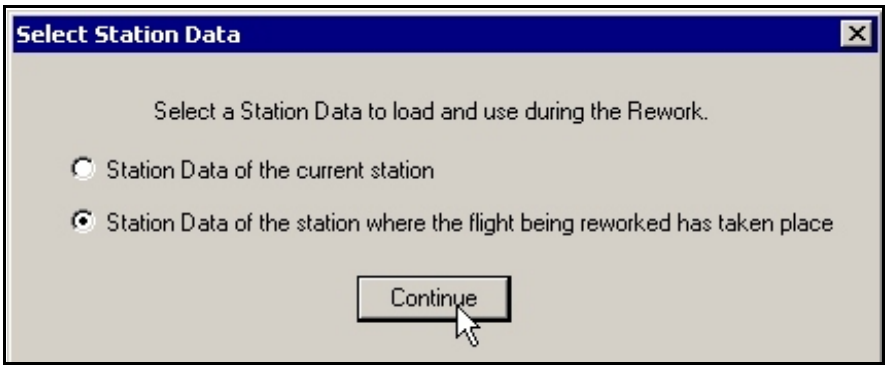


Exhibit 4-5 Select Station Data

6. The RWS window appears. (See Exhibit 4-6) You may now select which options you might wish to view from the Rework flight you have chosen.

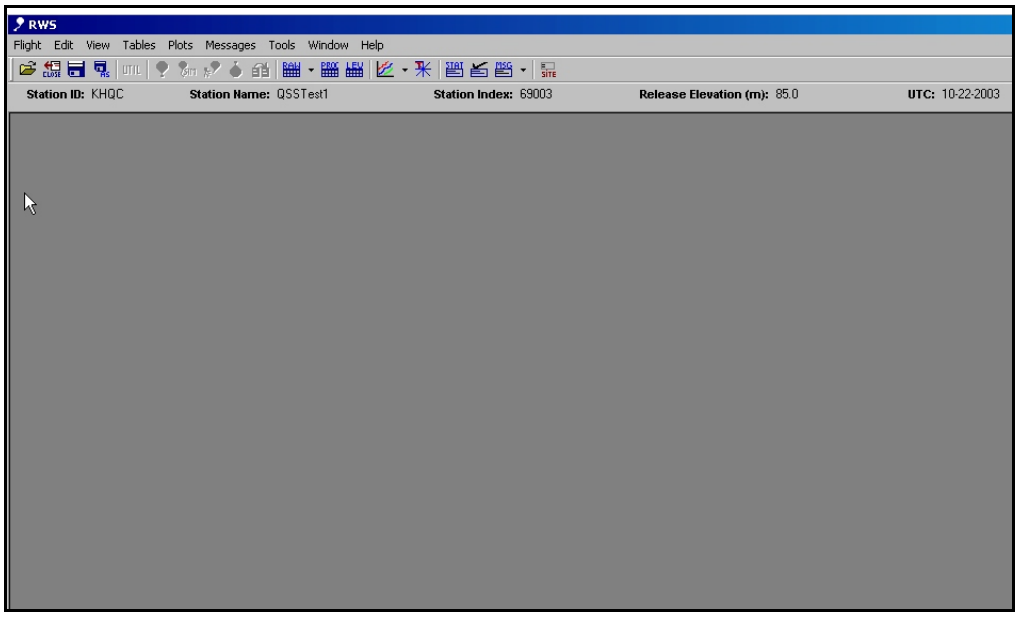


Exhibit 4-6 RWS Window

7. There are numerous Options from the RWS window to select. Beginning at the top left of the screen, look at the possible options. Flight and Edit options will be discussed later.

4.2.2 View Options

1. Click on the View option at the top of the RWS window a drop-down will appear as shown below. (See Exhibit 4-7) Items that are grayed out can not be viewed or opened.

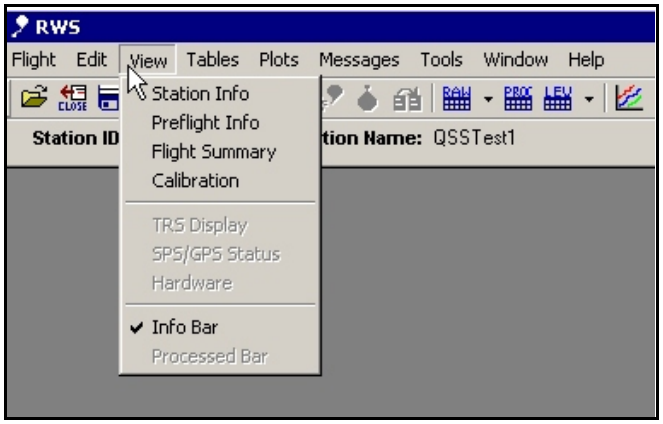


Exhibit 4-7 View Options

2. Click on Station Information option. Station Data window appears. (See Exhibit 4-7.1)

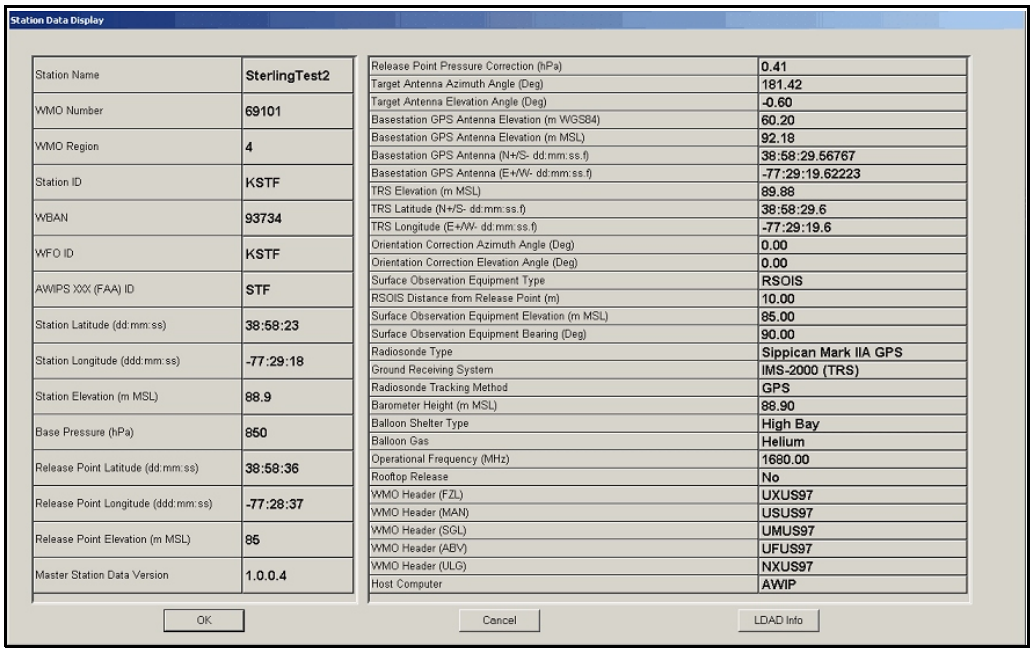


Exhibit 4-7.1 Station Information

3. After clicking on the OK or Cancel button, select Pre-flight Information option. The Administrative Display window appears. (See Exhibit 4-7.2A)

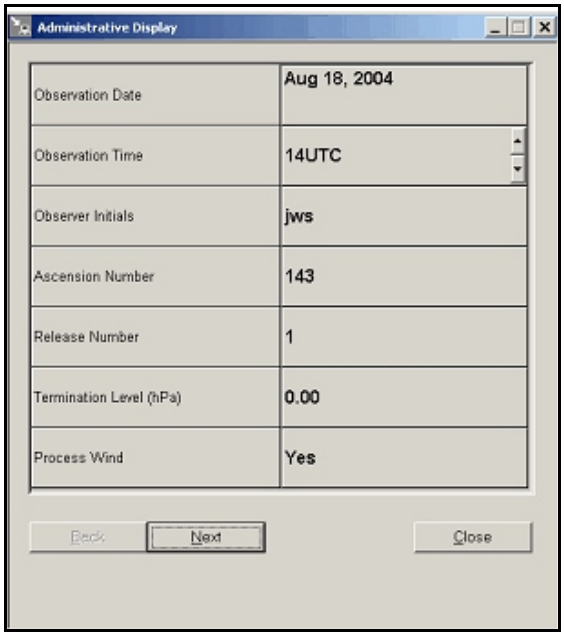


Exhibit 4-7.2A Administrative Display

4. Click on the Next button. The Equipment Display appears. (See Exhibit 4-7.2B)

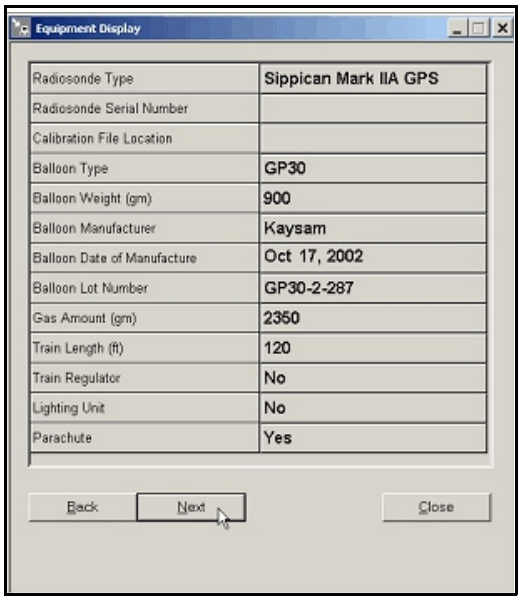


Exhibit 4-7.2B Equipment Display

NOTE: The Radiosonde Serial Number and Calibration File Location blocks are blank. This information is transmitted by the radiosonde.

5. Click the Next button with the mouse, the Surface Observation Display appears. All data may be changed in Rework. The Release Point Pressure is a derived entry made by the software and changes if the Surface Pressure is changed. (See Exhibit 4-7.2C)

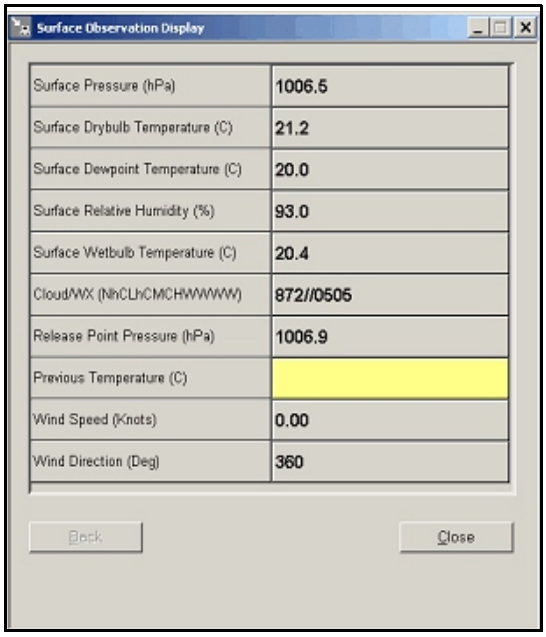


Exhibit 4-7.2C Surface Observation

6. Click the Close button to exit Pre-flight Info. Select the Flight Summary option. (See Exhibit 4-7.3)

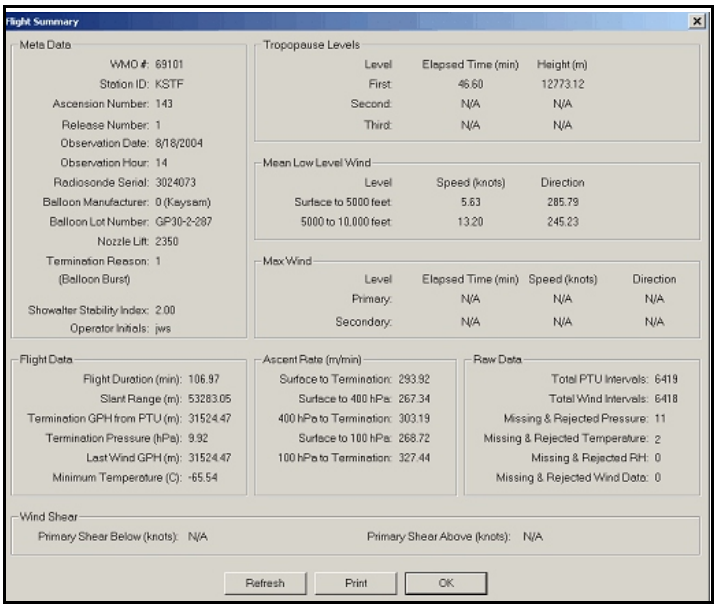


Exhibit 4-7.3 Flight Summary

7. Click on the OK button. Select the Calibration option. Radiosonde Calibration data appears. The first 7 digits to the right of Sippican Binary is the radiosonde serial number. (See Exhibit 4-7.4) The radiosonde calibration data is unique to each instrument providing values by which the sensors have been calibrated. Click on the OK button to close.

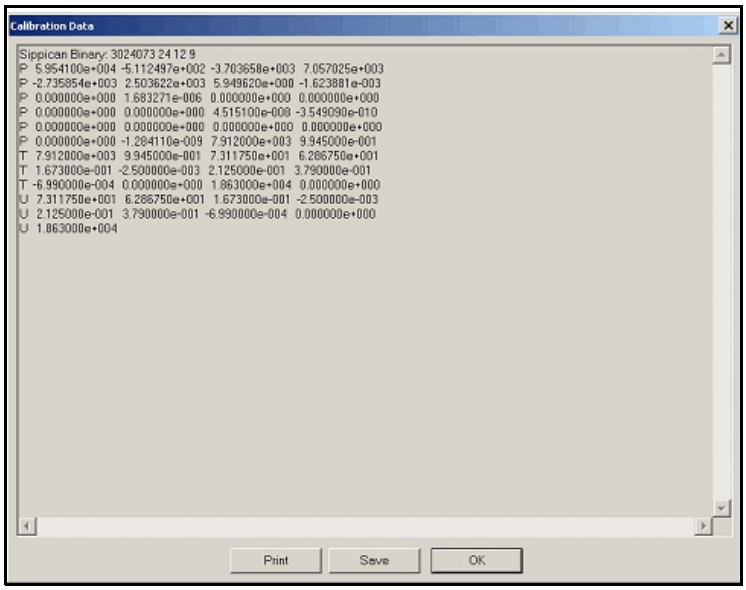


Exhibit 4-7.4 Calibration Data

8. Information Bar option displays your station information at the top of the window. If reworking a flight from another site, it will not display that site's information. Clicking on the Info Bar option will place a check to the left of the option, and site information will display. (See Exhibit 4-7.5)

Exhibit 4-7.5 Station Information Bar

9. Processed Bar option is grayed out and not available in Rework.

4.2.3 Tables Options

1. Click on Tables at the top of the RWS window. (See Exhibit 4-8) Go down the list and become familiar with the various tables.

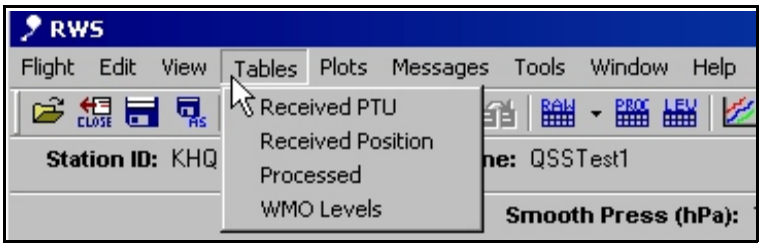
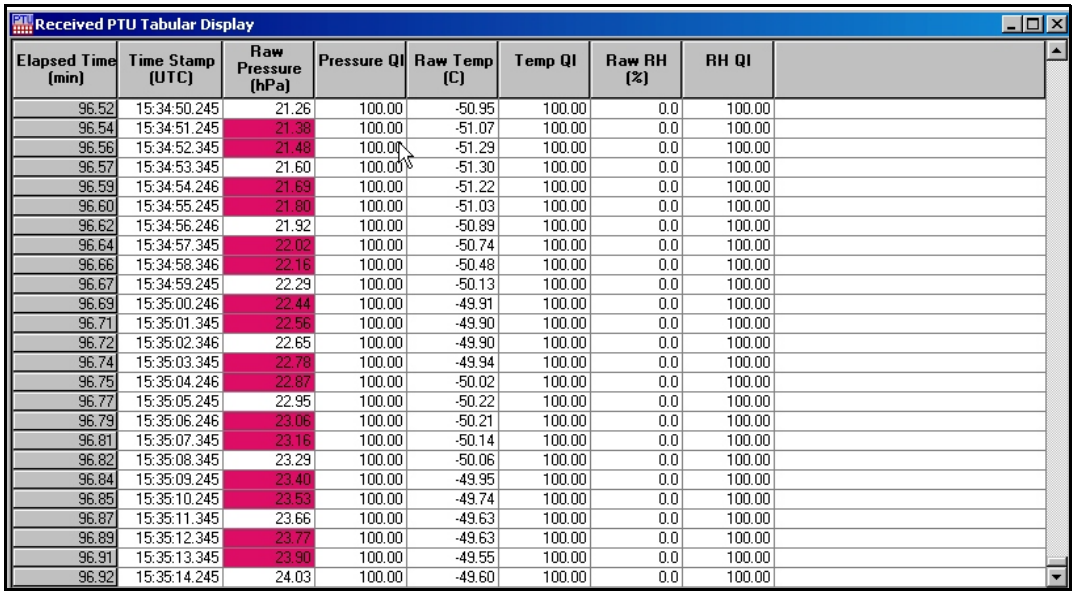


Exhibit 4-8 Tables Options

2. Select the Received PTU option. PTU Tabular Display at the end of the flight appears. (See Exhibit 4-8.1)



Received PTU Tabular Display

Elapsed Time (min)	Time Stamp (UTC)	Raw Pressure (hPa)	Pressure QI	Raw Temp (C)	Temp QI	Raw RH (%)	RH QI
96.52	15:34:50.245	21.26	100.00	-50.95	100.00	0.0	100.00
96.54	15:34:51.245	21.38	100.00	-51.07	100.00	0.0	100.00
96.56	15:34:52.345	21.48	100.00	-51.29	100.00	0.0	100.00
96.57	15:34:53.345	21.60	100.00	-51.30	100.00	0.0	100.00
96.59	15:34:54.246	21.69	100.00	-51.22	100.00	0.0	100.00
96.60	15:34:55.245	21.80	100.00	-51.03	100.00	0.0	100.00
96.62	15:34:56.246	21.92	100.00	-50.89	100.00	0.0	100.00
96.64	15:34:57.345	22.02	100.00	-50.74	100.00	0.0	100.00
96.66	15:34:58.346	22.16	100.00	-50.48	100.00	0.0	100.00
96.67	15:34:59.245	22.29	100.00	-50.13	100.00	0.0	100.00
96.69	15:35:00.246	22.44	100.00	-49.91	100.00	0.0	100.00
96.71	15:35:01.345	22.56	100.00	-49.90	100.00	0.0	100.00
96.72	15:35:02.346	22.65	100.00	-49.90	100.00	0.0	100.00
96.74	15:35:03.345	22.78	100.00	-49.94	100.00	0.0	100.00
96.75	15:35:04.246	22.87	100.00	-50.02	100.00	0.0	100.00
96.77	15:35:05.245	22.95	100.00	-50.22	100.00	0.0	100.00
96.79	15:35:06.246	23.06	100.00	-50.21	100.00	0.0	100.00
96.81	15:35:07.345	23.16	100.00	-50.14	100.00	0.0	100.00
96.82	15:35:08.345	23.29	100.00	-50.06	100.00	0.0	100.00
96.84	15:35:09.245	23.40	100.00	-49.95	100.00	0.0	100.00
96.85	15:35:10.245	23.53	100.00	-49.74	100.00	0.0	100.00
96.87	15:35:11.345	23.66	100.00	-49.63	100.00	0.0	100.00
96.89	15:35:12.345	23.77	100.00	-49.63	100.00	0.0	100.00
96.91	15:35:13.345	23.90	100.00	-49.55	100.00	0.0	100.00
96.92	15:35:14.245	24.03	100.00	-49.60	100.00	0.0	100.00

Exhibit 4-8.1 Received PTU Tabular Display

NOTE: PTU is an abbreviation for Pressure, Temperature, and Relative Humidity data.

3. To scroll to the top of the table, right click in the scroll bar column and select Top. (See Exhibit 4-8.1A) These options are available with all displays having a scroll bar.

Exhibit 4-8.1A
Scroll Options

4. Return the cursor inside the Received PTU Tabular Display and right click. The option window below appears. (See Exhibit 4-8.1B) This table is available with all tables.

NOTE: The Configuration option is grayed out, Raw PTU is not configurable or editable.

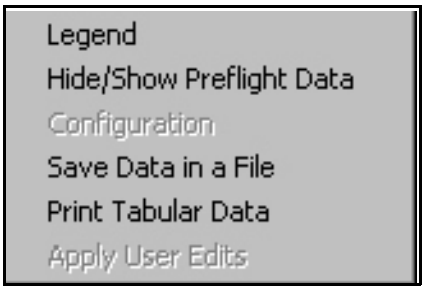


Exhibit 4-8.1B PTU Options

5. Click on Legend to see data the various colors describe. (See Exhibit 4-8.1C)

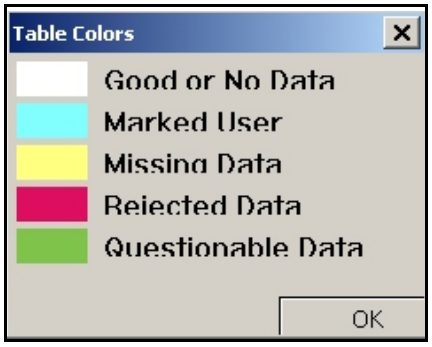


Exhibit 4-8.1C Table Colors

NOTE: White is Good Data...Blue is Marked Data....Yellow is Missing Data
Red is Rejected Data....and Green is Questionable Data

6. The Hide/Show Pre-flight Data option turns off or on the data-points during pre-flight.

7. The Configuration option is not available with unprocessed data. If the Save Data in a File option is selected, the following display appears. (See Exhibit 4-8.1D)

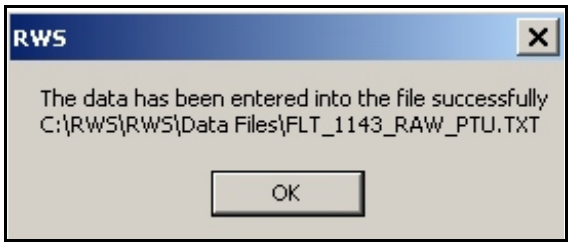


Exhibit 4-8.1D Save to File

8. Click the "OK" to exit. Click on Print Tabular Data option. The Print window appears. The operator may select a given range of data to print by defining "From and To" times, or print all data. (See Exhibit 4-8.1E)

CAUTION: The print defaults to "ALL", but "ALL" may print an excessively large number of pages. This should be used seldom, if ever, with unprocessed data.

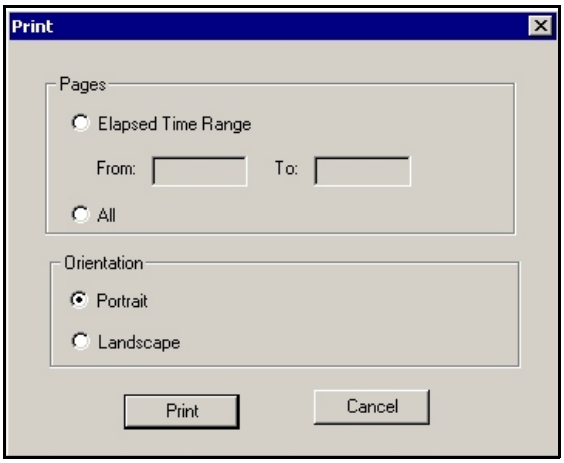
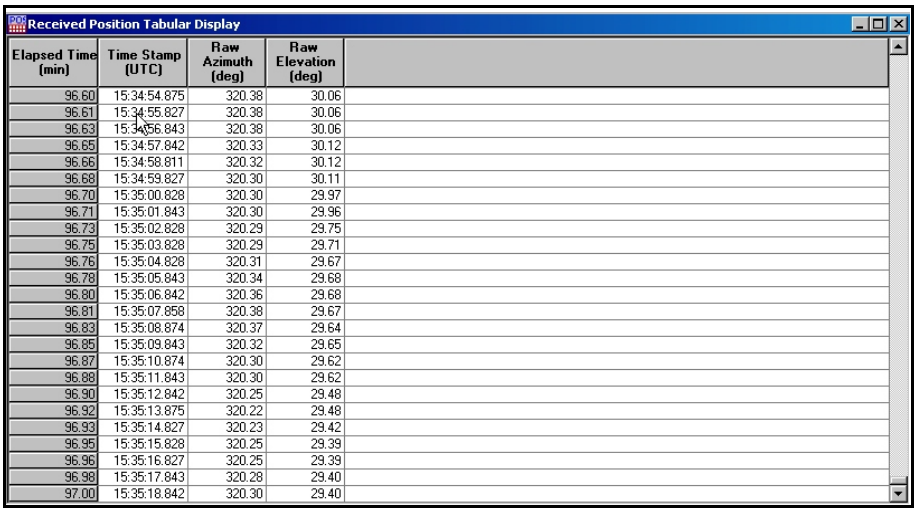


Exhibit 4-8.1E Print Options

9. Other options may be viewed by moving the cursor on the top left icon within the Received PTU Tabular Display and clicking the left mouse button. (See Exhibit 4-8.1F) The options are self-explanatory. These options are available of other Tables, Plots, and Message windows.

Exhibit 4-8.1F Table Size/Move Options

10. Click on the "X" in the top right corner to close the Received PTU Tabular Display window. Click on the Received Position option under the Tables. (See Exhibit 4-8.2) The Received Position data is raw data from the TRS antenna. The scroll bar options, the screen options, and size/move options work with display and the other tables.

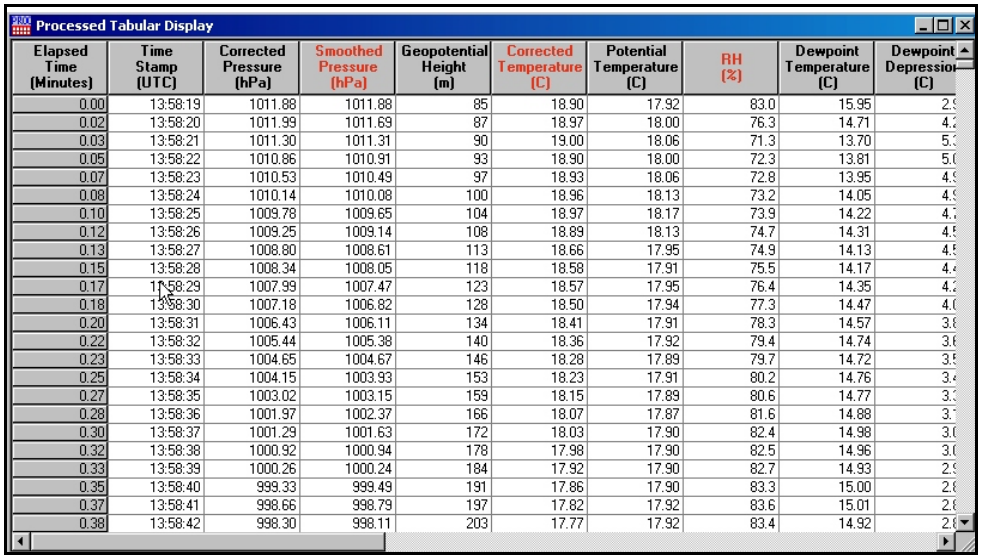


Received Position Tabular Display

Elapsed Time (min)	Time Stamp (UTC)	Raw Azimuth (deg)	Raw Elevation (deg)
96.60	15:34:54.875	320.38	30.06
96.61	15:34:55.827	320.38	30.06
96.63	15:34:56.843	320.38	30.06
96.65	15:34:57.842	320.33	30.12
96.66	15:34:58.811	320.32	30.12
96.68	15:34:59.827	320.30	30.11
96.70	15:35:00.828	320.30	29.97
96.71	15:35:01.843	320.30	29.96
96.73	15:35:02.828	320.29	29.75
96.75	15:35:03.828	320.29	29.71
96.76	15:35:04.828	320.31	29.67
96.78	15:35:05.843	320.34	29.68
96.80	15:35:06.842	320.36	29.68
96.81	15:35:07.858	320.38	29.67
96.83	15:35:08.874	320.37	29.64
96.85	15:35:09.843	320.32	29.65
96.87	15:35:10.874	320.30	29.62
96.88	15:35:11.843	320.30	29.62
96.90	15:35:12.842	320.25	29.48
96.92	15:35:13.875	320.22	29.48
96.93	15:35:14.827	320.23	29.42
96.95	15:35:15.828	320.25	29.39
96.96	15:35:16.827	320.25	29.39
96.98	15:35:17.843	320.28	29.40
97.00	15:35:18.842	320.30	29.40

Exhibit 4-8.2 Received Position Tabular Display

11. Move the cursor to the "X" in the top right corner to close the window. Return to the top of the RWS window and select "Processed" under Tables. (See Exhibit 4-8.3) All functions with the previous tables are available along with the options for **"Configuration"** and **"Apply User Edits"**by striking the right mouse button while the cursor is inside the tabular display.



Processed Tabular Display

Elapsed Time (Minutes)	Time Stamp (UTC)	Corrected Pressure (hPa)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	Potential Temperature (C)	RH (%)	Dewpoint Temperature (C)	Dewpoint Depressio
0.00	13:58:19	1011.88	1011.88	85	18.90	17.92	83.0	15.95	2.9
0.02	13:58:20	1011.99	1011.69	87	18.97	18.00	76.3	14.71	4.2
0.03	13:58:21	1011.30	1011.31	90	19.00	18.06	71.3	13.70	5.3
0.05	13:58:22	1010.86	1010.91	93	18.90	18.00	72.3	13.81	5.0
0.07	13:58:23	1010.53	1010.49	97	18.93	18.06	72.8	13.95	4.9
0.08	13:58:24	1010.14	1010.08	100	18.96	18.13	73.2	14.05	4.9
0.10	13:58:25	1009.78	1009.65	104	18.97	18.17	73.9	14.22	4.7
0.12	13:58:26	1009.25	1009.14	108	18.89	18.13	74.7	14.31	4.8
0.13	13:58:27	1008.80	1008.61	113	18.66	17.95	74.9	14.13	4.5
0.15	13:58:28	1008.34	1008.05	118	18.58	17.91	75.5	14.17	4.4
0.17	13:58:29	1007.99	1007.47	123	18.57	17.95	76.4	14.35	4.2
0.18	13:58:30	1007.18	1006.82	128	18.50	17.94	77.3	14.47	4.0
0.20	13:58:31	1006.43	1006.11	134	18.41	17.91	78.3	14.57	3.8
0.22	13:58:32	1005.44	1005.38	140	18.36	17.92	79.4	14.74	3.8
0.23	13:58:33	1004.65	1004.67	146	18.28	17.89	79.7	14.72	3.5
0.25	13:58:34	1004.15	1003.93	153	18.23	17.91	80.2	14.76	3.4
0.27	13:58:35	1003.02	1003.15	159	18.15	17.89	80.6	14.77	3.3
0.28	13:58:36	1001.97	1002.37	166	18.07	17.87	81.6	14.88	3.1
0.30	13:58:37	1001.29	1001.63	172	18.03	17.90	82.4	14.98	3.0
0.32	13:58:38	1000.92	1000.94	178	17.98	17.90	82.5	14.96	3.0
0.33	13:58:39	1000.26	1000.24	184	17.92	17.90	82.7	14.93	2.9
0.35	13:58:40	999.33	999.49	191	17.86	17.90	83.3	15.00	2.8
0.37	13:58:41	998.66	998.79	197	17.82	17.92	83.6	15.01	2.8
0.38	13:58:42	998.30	998.11	203	17.77	17.92	83.4	14.92	2.8

Exhibit 4-8.3 Processed Tabular Display

12. Selecting the Configuration Option allows the operator to select or deselect any parameters as well as changing the time interval in the table. (See Exhibit 4-8.3A)

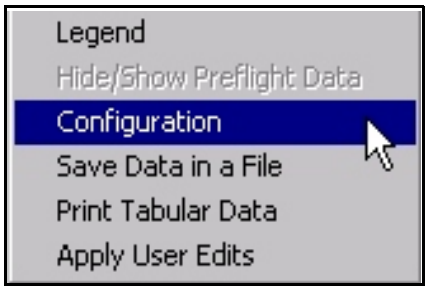


Exhibit 4-8.3A Configuration Options

13. The Processed Data Display Configuration window appears after selecting Configuration. (See Exhibit 4-8.3B) It allows the operator to move the cursor over each item on the list and either select or deselect the items. This window also allows the operator to change the displayed processed data display interval from 1 data-point per second up to a data-point every **60** seconds.

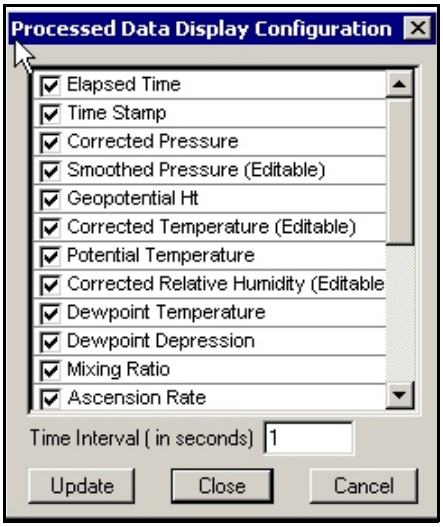
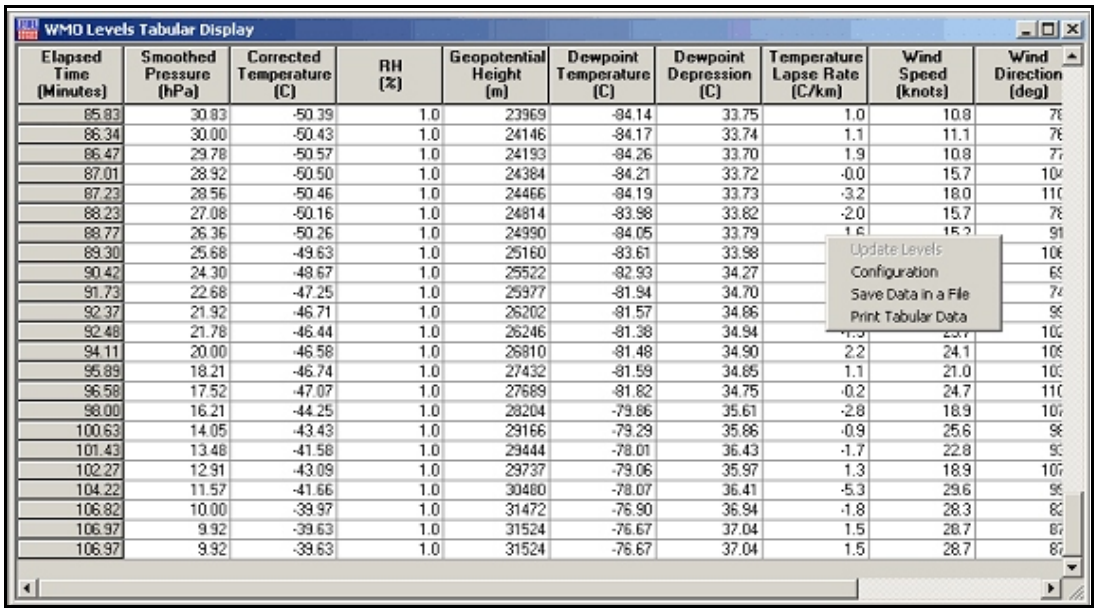


Exhibit 4-8.3B Configuration Display

NOTE: Only columns with a red header may be marked. Clicking and dragging on the Elapsed Time column will mark all editable data. The only PTU editable columns are the Smoothed Pressure, Corrected Temperature, and RH.
If data is marked for less than a minute, it will be interpolated. Data marked for 1 minute or more will be made missing. ***Data can only be marked in the 1-second time interval.***

14. Move the cursor to the top right corner of the Processed Tabular Display and click on the "X" to close the window. At the Tables Option, select the WMO Levels Option. (See Exhibit 4-8.4) The Update Levels Option does not work in Rework. During Live or Simulated Flights the Update Levels option will rerun the Check, Status, and Coded Messages. Move the cursor to the top right corner and click on the "X" to exit to close the window.



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Corrected Temperature (C)	RH (%)	Geopotential Height (m)	Dewpoint Temperature (C)	Dewpoint Depression (C)	Temperature Lapse Rate (C/km)	Wind Speed (knots)	Wind Direction (deg)
85.83	30.83	-50.39	1.0	23969	-84.14	33.75	1.0	10.8	7
86.34	30.00	-50.43	1.0	24146	-84.17	33.74	1.1	11.1	7
86.47	29.78	-50.57	1.0	24193	-84.26	33.70	1.9	10.8	7
87.01	28.92	-50.50	1.0	24384	-84.21	33.72	-0.0	15.7	10
87.23	28.56	-50.46	1.0	24466	-84.19	33.73	-3.2	18.0	11
88.23	27.08	-50.16	1.0	24814	-83.98	33.82	-2.0	15.7	7
88.77	26.36	-50.26	1.0	24990	-84.05	33.79	1.6	15.2	9
89.30	25.68	-49.63	1.0	25160	-83.61	33.98			10
90.42	24.30	-48.67	1.0	25522	-82.93	34.27			6
91.73	22.68	-47.25	1.0	25977	-81.94	34.70			7
92.37	21.92	-46.71	1.0	26202	-81.57	34.86			9
92.48	21.78	-46.44	1.0	26246	-81.38	34.94			10
94.11	20.00	-46.58	1.0	26810	-81.48	34.90	2.2	24.1	10
95.89	18.21	-46.74	1.0	27432	-81.59	34.85	1.1	21.0	10
96.58	17.52	-47.07	1.0	27689	-81.82	34.75	-0.2	24.7	11
98.00	16.21	-44.25	1.0	28204	-79.86	35.61	-2.8	18.9	10
100.63	14.05	-43.43	1.0	29166	-79.29	35.86	-0.9	25.6	9
101.43	13.48	-41.58	1.0	29444	-78.01	36.43	-1.7	22.8	9
102.27	12.91	-43.09	1.0	29737	-79.06	35.97	1.3	18.9	10
104.22	11.57	-41.66	1.0	30480	-78.07	36.41	-5.3	29.6	9
106.82	10.00	-39.97	1.0	31472	-76.90	36.94	-1.8	28.3	8
106.97	9.92	-39.63	1.0	31524	-76.67	37.04	1.5	28.7	8
106.97	9.92	-39.63	1.0	31524	-76.67	37.04	1.5	28.7	8

Exhibit 4-8.4 WMO Levels Display Options

A Level Identifier is assigned to each level that is displayed and stored in the RWS database. The following level identifiers are supported.

NOTE: Levels may not be added or deleted through the WMO Levels Display. Data may only be "Marked" in the Processed Data Display.

WMO Levels Identifiers

ID	Code Meaning
1	Within 20 hPa of surface
2	Pressure less than 10 hPa (i.e., 9, 8, 7, etc.) when no other reason applies
3	Base pressure level for stability index
6	Begin missing RH data
7	Begin missing temperature data
8	Highest level reached before balloon descent because of icing or turbulence
11	End missing RH data
12	End missing temperature data
13	Zero degrees C crossing(s) for RADAT
14	Standard pressure level
15	Operator added level
16	Operator deleted level
17	Balloon re-ascended beyond previous highest ascent level
18	Significant RH level
20	Surface level
21	Significant temperature level
23	Flight termination level
24	Tropopause(s)
28	Significant wind level
29	Maximum wind level
30	Incremental wind level (fixed regional)
32	Wind termination level
33	Pressure 100 to 110 hPa, when no other reason applies
40	Significant thermodynamic level (inversion)
41	Significant RH level (per NCDC criteria)
42	Significant temperature level (per NCDC criteria)
43	Begin missing wind data
44	End missing wind data

4.2.4 Plot Options

The Plot options are important aids for the operator to eliminate data that is obviously bad or at least questionable. The Plot screens provide a quick look at data trends and are helpful in picking out data that shows abrupt deviations from the other sensor points.

1. After clicking on Plots at the top of the RWS window, click on and open each Plot option. It is vital that each observer become thoroughly familiar with the different possible options within the plots. (See Exhibit 4-9)

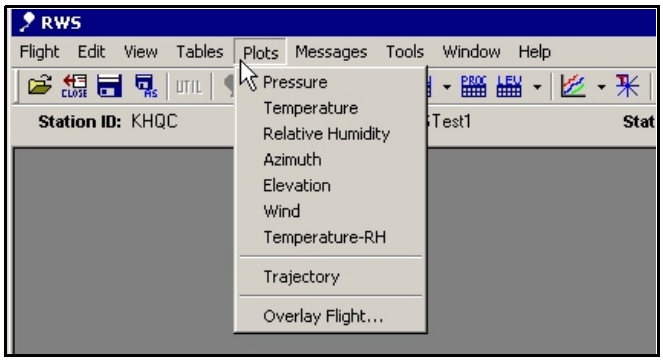


Exhibit 4-9 Plots Options

2. After clicking on Pressure, the following plot appears. (See Exhibit 4-9A)

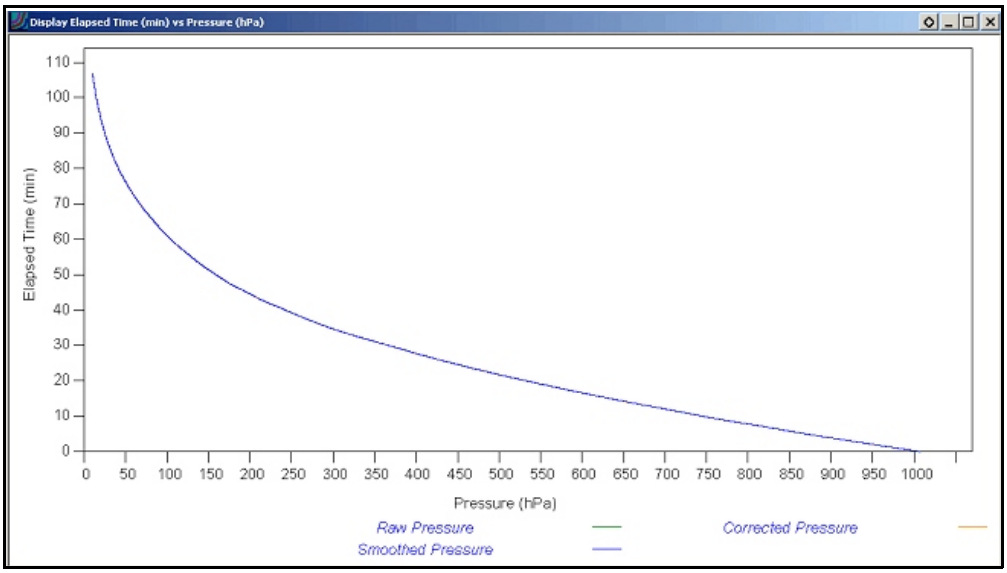


Exhibit 4-9A Pressure Plot

3. Right click inside the Plot window, the following window with Plot Options will appear. (See Exhibit 4-9.1)

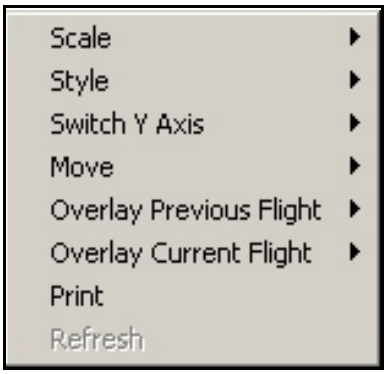


Exhibit 4-9.1 Plot Options

4. Move the cursor over the Scale Option. Additional Scaling Options will be displayed to the right of the Plot Options window. (See Exhibit 4-9.2) The default for scaling is Size to Fit.

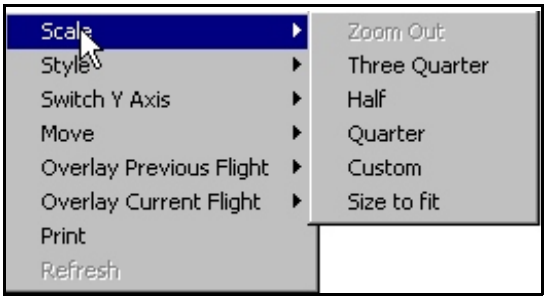


Exhibit 4-9.2 Scale Options

5. Click the left mouse button, this will clear the Plot Options. To reopen the Plot Options click the right mouse button after placing the cursor inside the Plot Display. Place the cursor over the Style Option. The Style Options window below will appear. (See Exhibit 4-9.3)

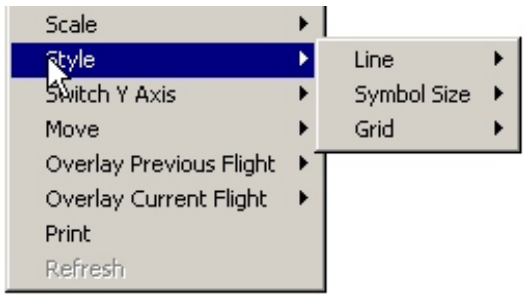


Exhibit 4-9.3 Style Options

6. Click the left mouse button, move the cursor inside the Plot Display and right click the mouse button to reopen the Plot Options. Move the cursor down to the Switch Y Axis Option. The Switch Y Axis Options window will appear. (See Exhibit 4-9.4)

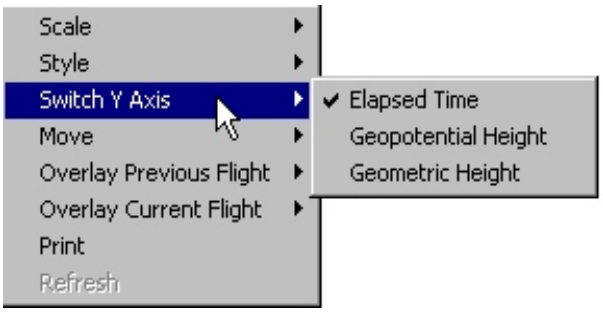


Exhibit 4-9.4 Switch Y Axis Options

7. Click the left mouse button, move the cursor inside the Plot Display and right click the mouse button to reopen the Plot Options and move the cursor down to the Move Option. All options in the Move option list are grayed out or inactive as seen in Exhibit 4-9.5.

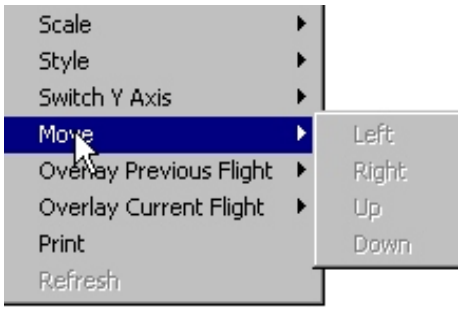


Exhibit 4-9.5 Move Options

8. Click the left mouse button, right click the mouse button to reopen the Plot Options and move the cursor down to the Overlay Previous Flight Option. Because no previous flight was taken, all options are grayed out or inactive. (See Exhibit 4-9.6)

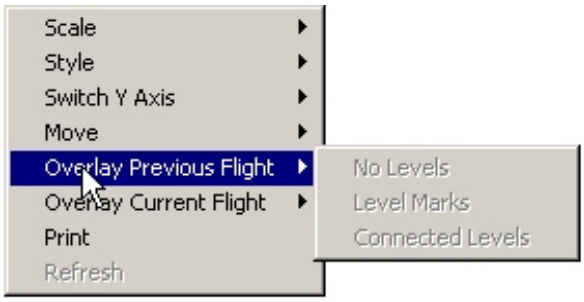


Exhibit 4-9.6 Overlay Previous Flight Options

9. Click the left mouse button to close the plot options. Right click the mouse button to reopen the Plot options and move the cursor to the Overlay Current Flight option. (See Exhibit 4-9.7) Some options are grayed out or inactive. If the Level Marks is selected all levels will be displayed.

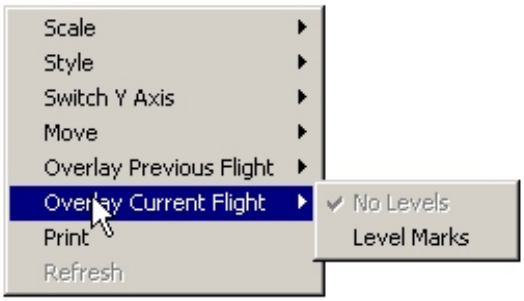


Exhibit 4-9.7 Overlay Current Flight Options

10. Click the left mouse button to close the plot options. Right click the mouse button to reopen the Plot Options and move the cursor down to the Print Option. The plot will be printed if the OK button is selected. (See Exhibit 4-9.8)

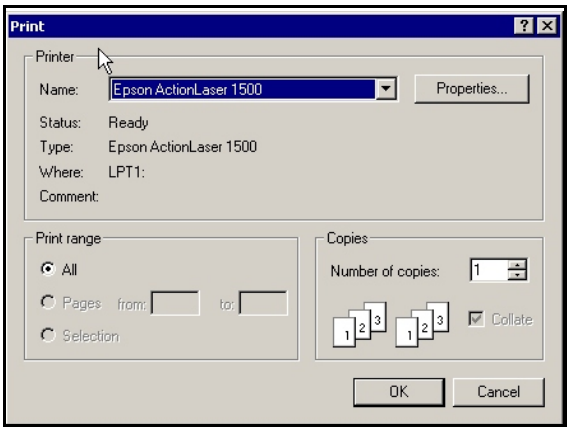


Exhibit 4-9.8 Print Window

11. Move the cursor to the top right corner of the Print window and click the mouse button on the "X". Then return to the Plots option at the top of the RWS window and select the Temperature option. (See Exhibit 4-9B) Right clicking the mouse button with the cursor inside the window will provide the user options shown earlier. Moving the cursor to the far left corner of the window and clicking the left mouse button will provide the Size/Move options.

NOTE: The differences between the Raw Temperature and Corrected Temperature in Exhibit 4-9B above 50 minutes. This is the solar or radiation correction.

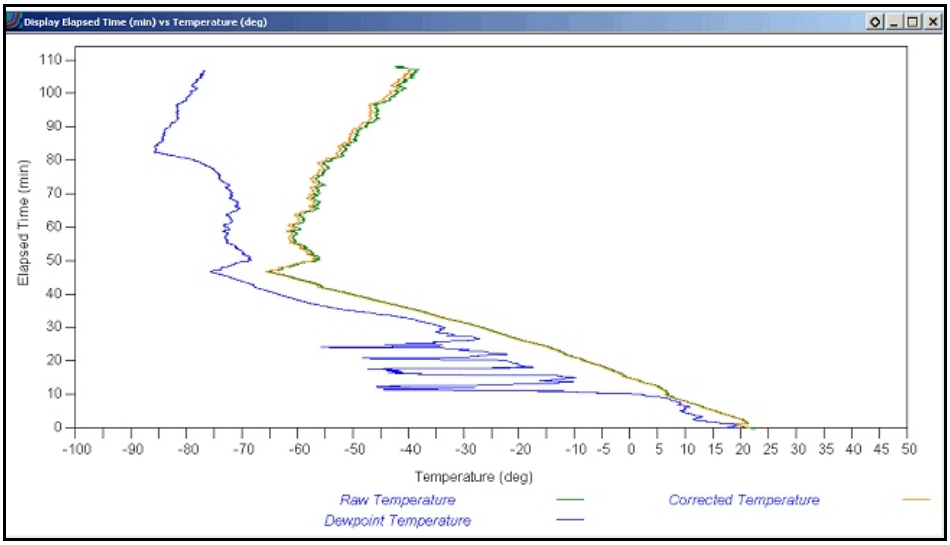


Exhibit 4-9B Temperature Plot

12. Move the cursor to the top right corner and click the mouse button on the "X". Then return to the Plots option at the top of the RWS window and select the Relative Humidity option. (See Exhibit 4-9C)

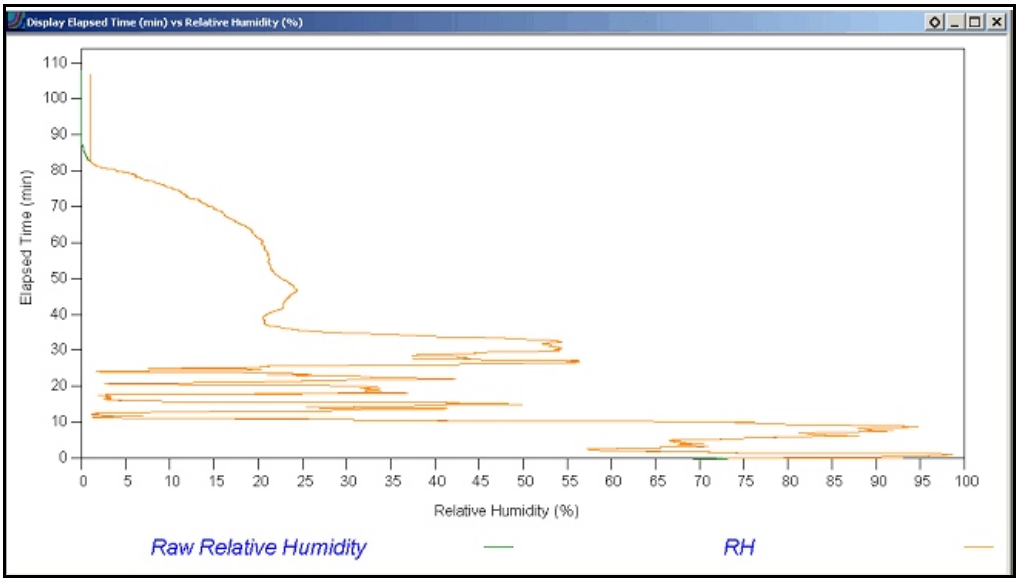


Exhibit 4-9C Relative Humidity Plot

13. Move the cursor to the top right corner and click the mouse button on the "X"to close the plot.. Then return to the Plots option at the top of the RWS window and select the Azimuth option. (See Exhibit 4-9D)

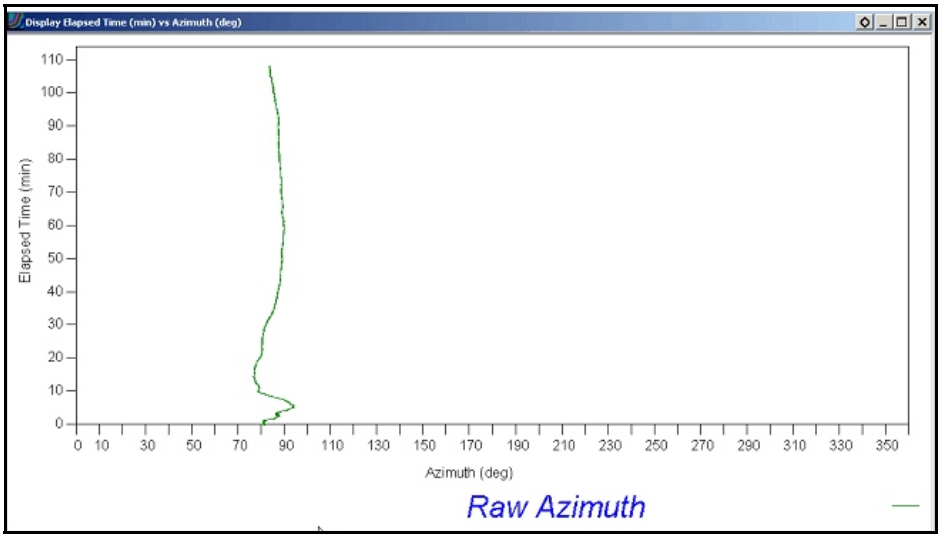


Exhibit 4-9D TRS Azimuth Plot

14. Move the cursor to the top right corner and click the mouse button on the "X". Then return to the Plots option and select the Elevation option. (See Exhibit 4-9E) Placing the cursor on any point of the trend line will show it's raw value and time.

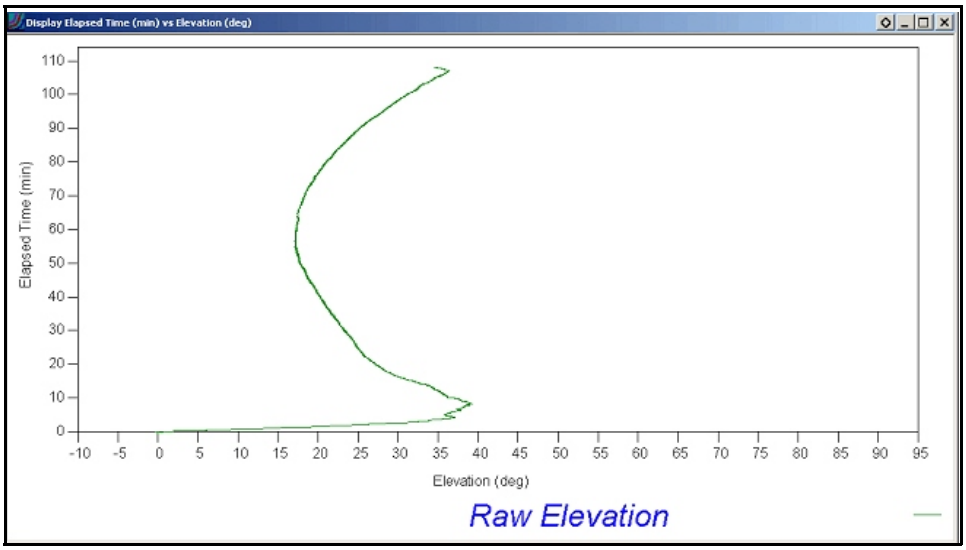


Exhibit 4-9E TRS Elevation Plot

NOTE: Raw Azimuth and Elevation Plots are from the TRS position during the flight. This is not reflective of the Wind plot which is acquired from GPS data.

15. Move the cursor to the top right corner and click the mouse button on the "X". Then return to the Plots option at the top of the RWS window and select the Wind option. (See Exhibit 4-9F)

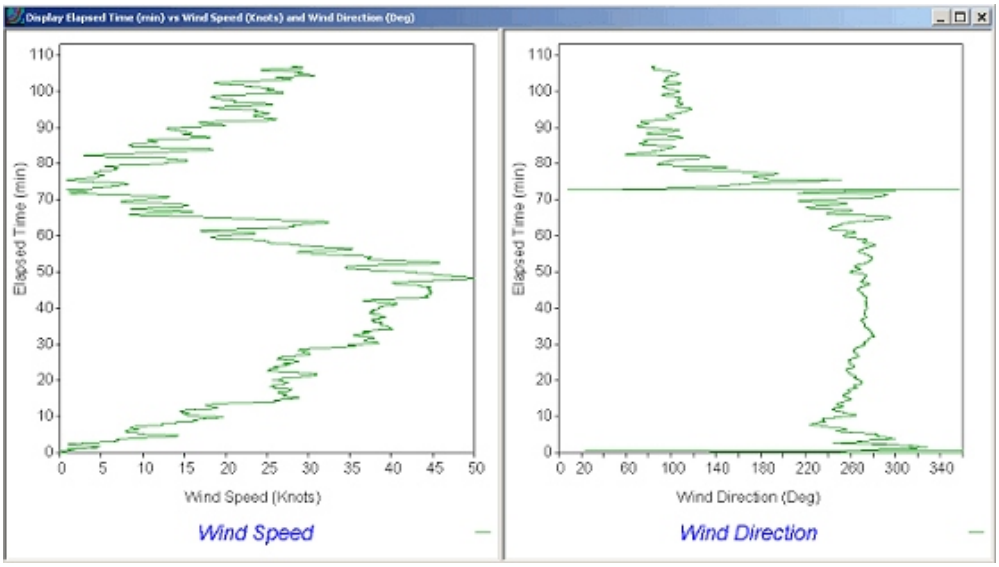


Exhibit 4-9F Wind Speed and Direction Plot

16. Move the cursor to the top right corner and click the mouse button on the "X". Then return to the Plots option at the top of the RWS window and select the Temperature-RH option. (See Exhibit 4-9G)

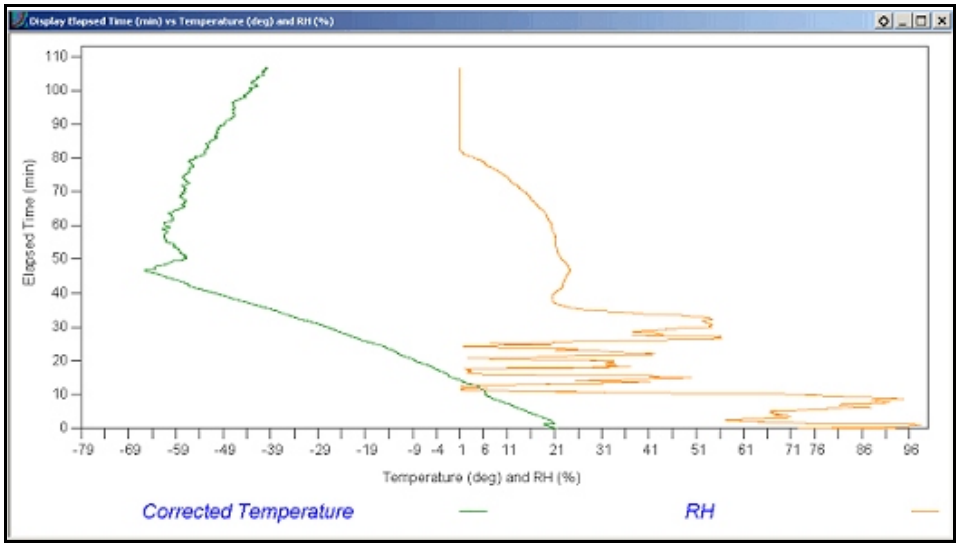


Exhibit 4-9G Temperature/RH Plot

17. Move the cursor to the top right corner and click the mouse button on the "X". Then return to the Plots option at the top of the RWS window and select the Trajectory option. (See Exhibit 4-9H)

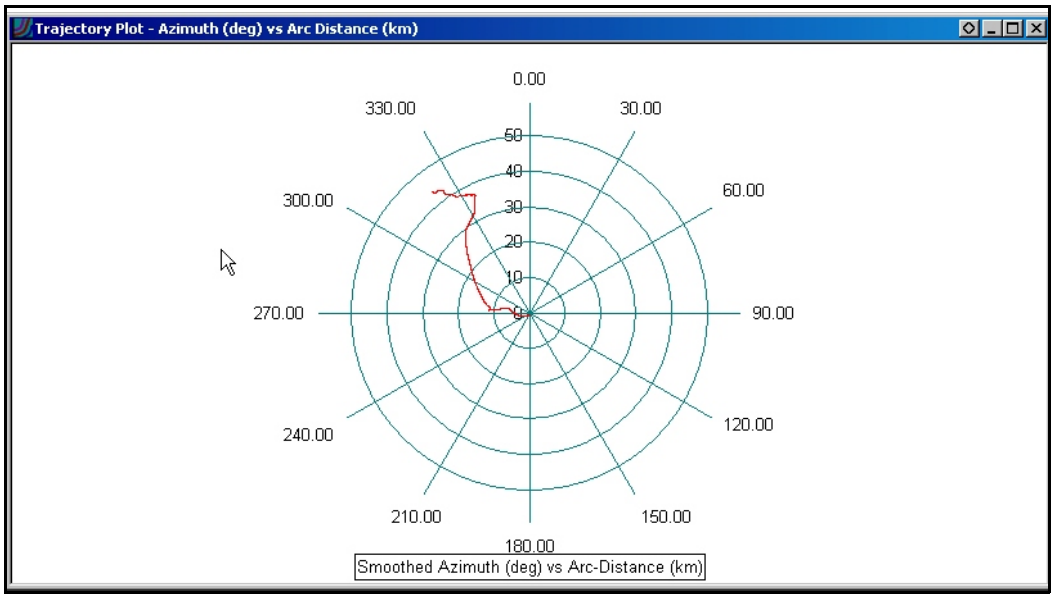


Exhibit 4-9H Trajectory Plot

18. There are two distinct options within the Trajectory Plot. Right click inside the plot and select the Scale option. (See Exhibit 4-9H.1)

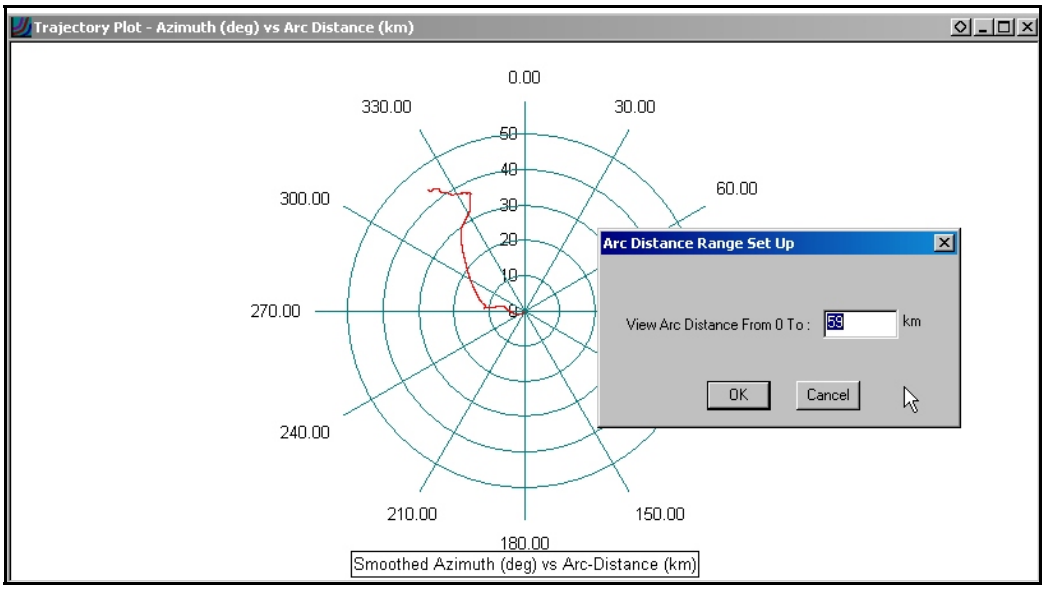


Exhibit 4-9H.1 Trajectory Scale Window

19. After reviewing the Scale option, click the right mouse button inside the Trajectory Plot and select the Zoom option. (See Exhibit 4-9H.2)

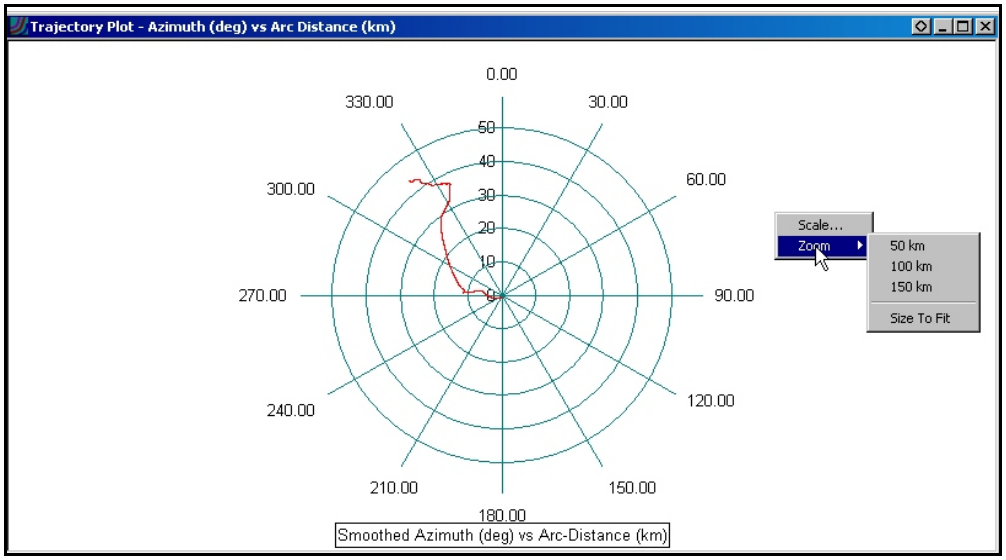


Exhibit 4-9H.2 Trajectory Zoom Window

20. Move the cursor to the top right corner and click the mouse button on the "X"to close the plot.

4.2.5 Messages Options

The Messages options provides the operator all the messages generated by the RRS software. This includes the Check, Status, and Coded Messages. Transmission of Coded Messages is covered in Chapter 10. Whenever messages are coded, the Check and Status Messages will be generated and displayed.

1. Exit the Plot options, move the cursor to the top of the RWS window and click the left mouse button on the Messages. (See Exhibit 4-10)

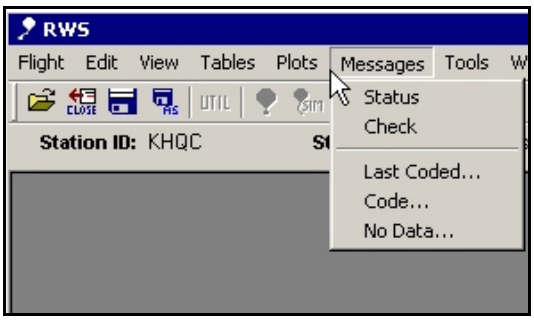


Exhibit 4-10 Messages List

2. Move the cursor over the Status option and click the left mouse button. The Status Message Display will appear. (See Exhibit 4-10.1) Flight Status Messages mark significant events prior to, during and after the flight. Moving the cursor on the scroll bar and right clicking allows options for easier viewing of the messages.

Status Messages Display

Add Message

UTC Time	Flight Status Message	Comment
12:03:45.00	Flight was initiated: Date 08-18-2004; Ascension 143; Release 1.	
12:05:08.82	Status Code: 0 - UPS has been turned off.	
12:05:19.25	TRS initialization in progress.	
12:05:19.28	TRS is ready.	
12:05:29.85	Status Code: 16 - UPS is now running on battery.	
12:05:35.22	Status Code: 8 - UPS is now running on on-line power supply.	
12:06:14.25	TRS completed initialization successfully.	
13:19:16.70	SPS has been initialized successfully.	
13:21:33.52	Radiosonde has been baselined successfully.	
13:36:51.17	No appropriate flight found for comparison.	
13:36:51.17	Balloon release detected at 13:36:50.614 UTC.	
13:39:06.94	Surface Observation data was successfully modified.	
13:39:08.08	Coded Messages were generated.	
13:43:25.80	Successful release.	
14:06:08.99	Coded Messages were generated.	
14:06:09.00	The RADAT message has been generated.	
14:47:32.98	Coded Messages were generated.	
15:25:05.13	Balloon burst detected at 107.0 minutes.	
15:25:05.13	Flight terminated: Balloon Burst.	
15:25:06.27	Flight Levels termination is set to 107.0 minutes	
15:25:07.65	Coded Messages were generated.	
15:25:09.46	Successful observation.	
15:27:09.09	Status Code: 0 - UPS has been turned off.	

Exhibit 4-10.1 Flight Status Message

3. Options within the Status Message Display may be viewed by clicking the right mouse button within the window. (See Exhibit 4-10.1A)

Status Messages Display

Add Message

UTC Time	Flight Status Message	Comment
12:03:45.00	Flight was initiated: Date 08-18-2004; Ascension 143; Release 1.	
12:05:08.82	Status Code: 0 - UPS has been turned off.	
12:05:19.25	TRS initialization in progress.	
12:05:19.28	TRS is ready.	
12:05:29.85	Status Code: 16 - UPS is now running on battery.	
12:05:35.22	Status Code: 8 - UPS is now running on on-line power supply.	
12:06:14.25	TRS completed initialization successfully.	
13:19:16.70	SPS has been initialized successfully.	
13:21:33.52	Radiosonde has been baselined successfully.	
13:36:51.17	No appropriate flight found for comparison.	
13:36:51.17	Balloon release detected at 13:36:50.614 UTC.	
13:39:06.94	Surface Observation data was successfully modified.	
13:39:08.08	Coded Messages were generated.	
13:43:25.80	Successful release.	
14:06:08.99	Coded Messages were generated.	
14:06:09.00	The RADAT message has been generated.	
14:47:32.98	Coded Messages were generated.	
15:25:05.13	Balloon burst detected at 107.0 minutes.	
15:25:05.13	Flight terminated: Balloon Burst.	
15:25:06.27	Flight Levels termination is set to 107.0 minutes	
15:25:07.65	Coded Messages were generated.	
15:25:09.46	Successful observation.	
15:27:09.09	Status Code: 0 - UPS has been turned off.	

Save Data in a File
Print Messages

Exhibit 4-10.1A Status Display Options

4. The Status Messages Display also allows the operator to place additional comments inside the remarks column by clicking on a line within the comment section. These comments are saved and may be retrieved by other observers or users of the archived data.

5. Click on the "Add Message" near the upper left corner of the Status Display to create a new User Added Status Message. A highlighted line will appear at the bottom of the display. (See Exhibit 4-10.1B) The operator may add comments inside this highlighted area.

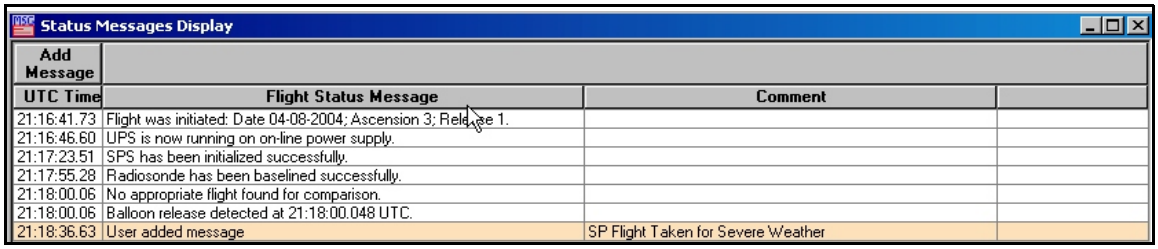


Exhibit 4-10.1B Add message to Status Message Display

6. Move the cursor to the top right of the window and click the left mouse button on the "X" to exit the Status Message Display. Return to the top of the RWS window and select the Check option. (See Exhibit 4-10.2)

NOTE: The operator should investigate all Check Messages during a Live Flight.

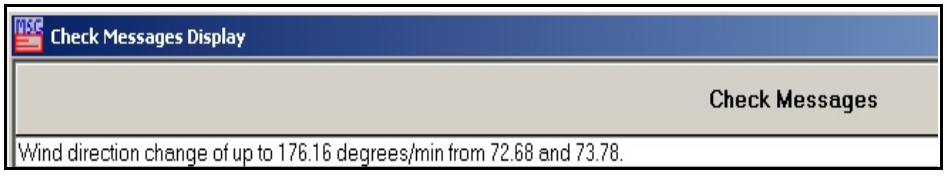


Exhibit 4-10.2 Check Messages

7. Move the cursor to the top right of the window and click the left mouse button on the "X" to exit the Check Message Display. Return to the top of the RWS window and select the Last Coded option. Notice the message that appears because no messages were transmitted. (See Exhibit 4-10.3)

Exhibit 4-10.3 No Message Can be Sent

8. After clicking "OK" the Status, Check Message Displays appear over the WMO Coded and RADAT Message Display. Move the cursor to the top right of each window and click the left mouse button on the "X" to arrive at the WMO Coded and RADAT Message Display. (See Exhibit 4-10.3A)

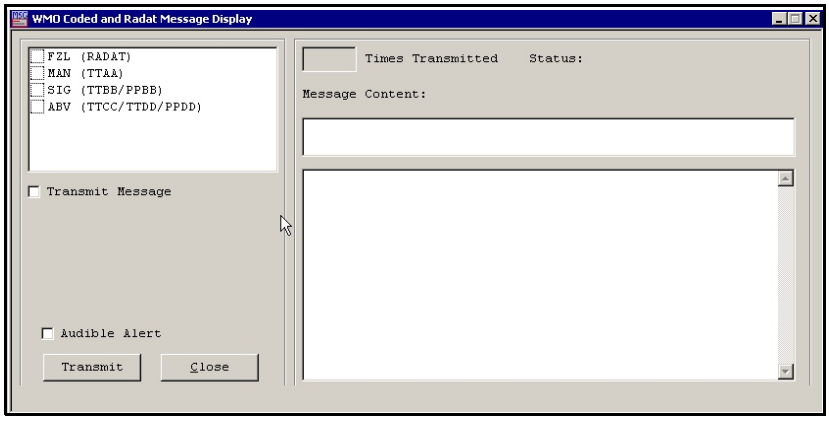


Exhibit 4-10.3A Last Coded Message Display

9. Move the cursor to the top left window in the WMO Coded and RADAT Message Display and click the left mouse button on the block to the left of FZL (RADAT). The RADAT message will appear in the bottom right window. (See Exhibit 4-10.4A)

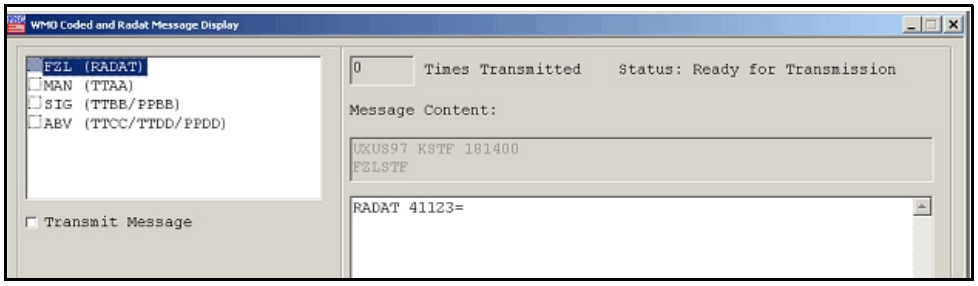


Exhibit 4-10.4A RADAT Message

10. Move the cursor to the MAN block and select to view. The TTAA Message will appear in the window. (See Exhibit 4-10.4B)

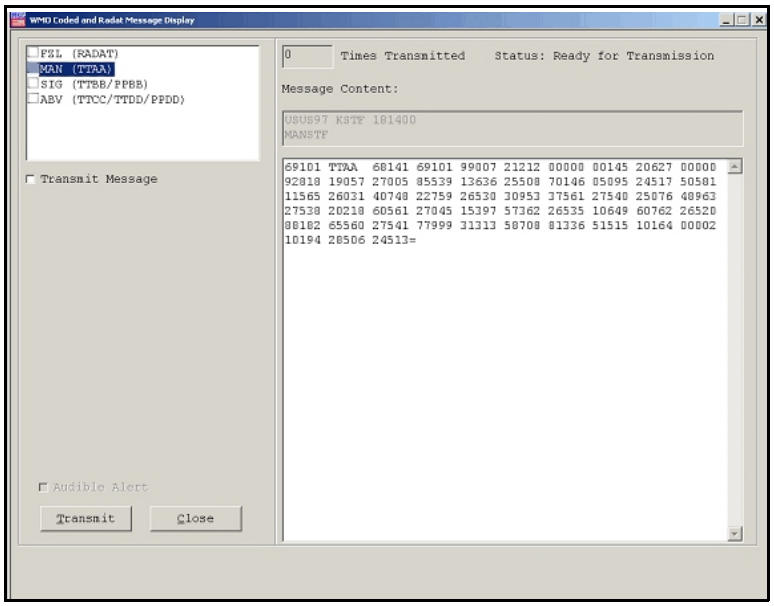


Exhibit 4-10.4B TTAA Message

11. Move the cursor to the SIG block and select to view. The TTBB and PPBB Messages will appear in the window. You may have to move the scroll bar down to see the PPBB Message. (See Exhibit 4-10.4C)

NOTE: The size of the TTBB and TTDD messages have increased. Significant levels for temperature are selected for .5 degrees linear departure to 100 hPa and 1 degree above 100 hPa. Relative humidity levels are selected for a 5% departure in linearity throughout the flight.

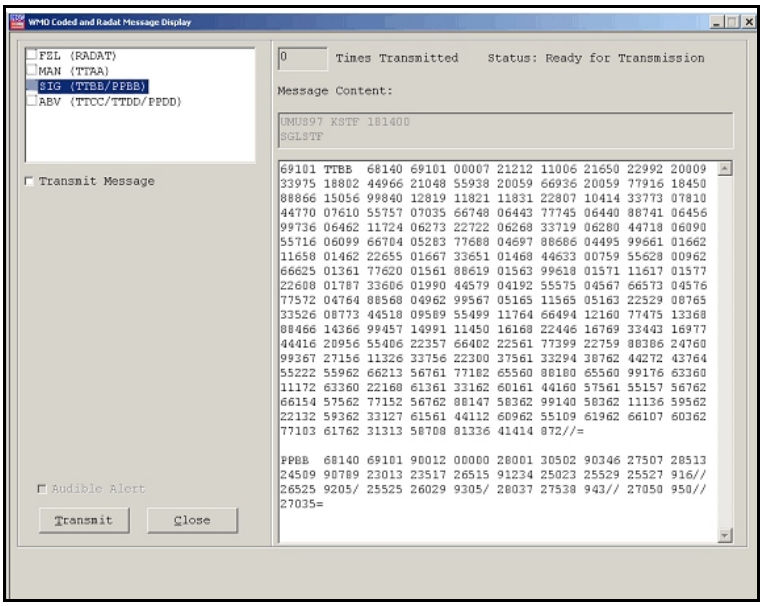


Exhibit 4-10.4C TTBB/PPBB Messages

12. Move the cursor to the ABV block and select to view. The TTCC, TTDD, and PPDD Messages will appear in the window. (See Exhibit 4-10.4D)

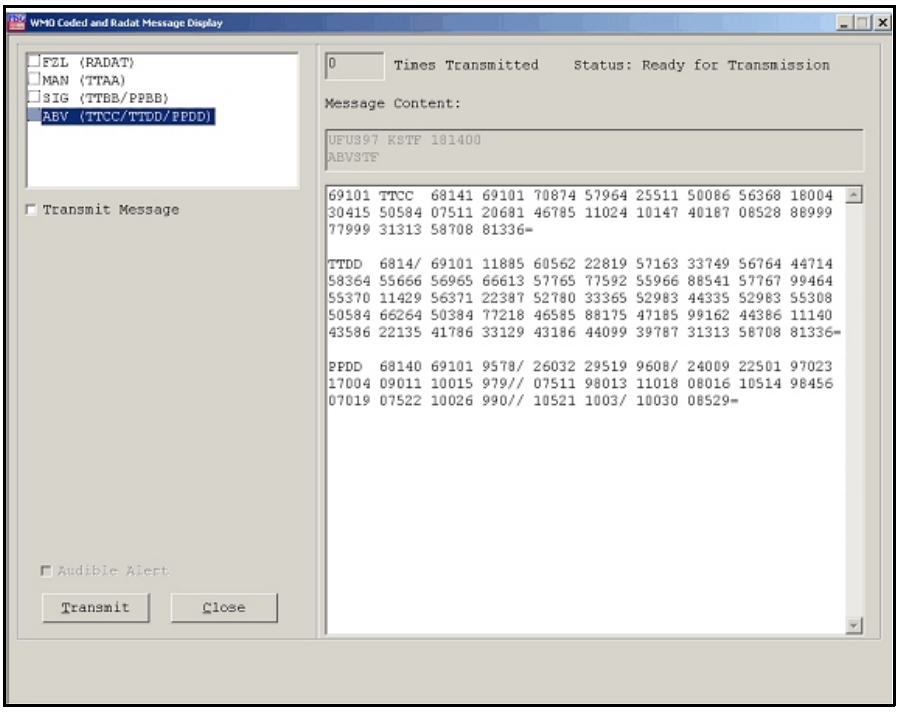


Exhibit 4-10.4D TTCC/TTDD/PPDD Messages

13. Move the cursor to the top right of the window and click the left mouse button on the "X" to exit the WMO Coded and Radat Message Display. Return to the top of the RWS window and select the Tools option. (See Exhibit 4-11)

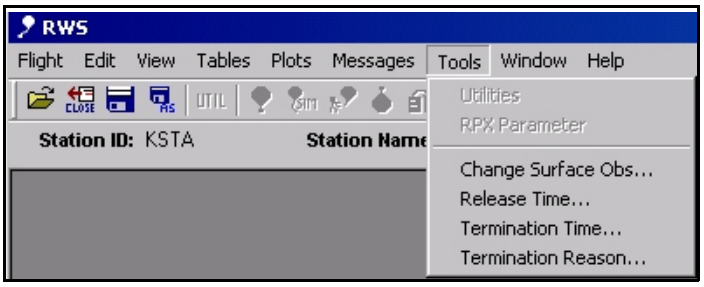


Exhibit 4-11 Tools Options

4.2.6 Tools Options

The Tools Option provides the operator the ability to change critical data that may adversely affect the data quality if not computed correctly. Use these options with extreme care to ensure data is not lost or corrupted.

NOTE: The Utilities and RPX Parameter options are grayed out during Rework. It may be entered only in the Offline mode.

1. Select the Change Surface Observation option from the Tools options. The operator may change any parameter. (See Exhibit 4-11A)

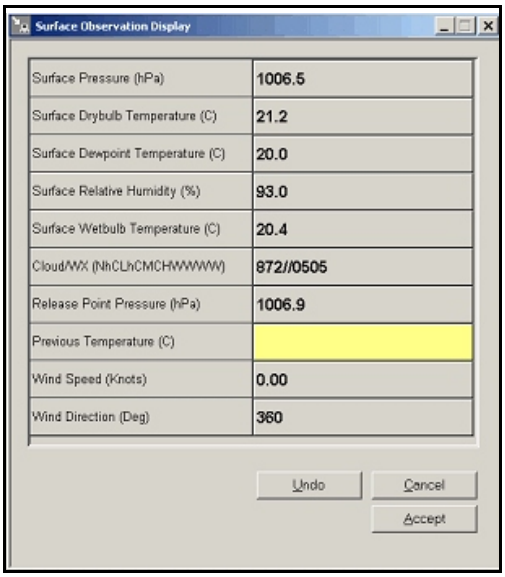


Exhibit 4-11A Surface Observation Display

2. Select the Change Release Time option from the Tools options. A window similar to Exhibit 4-11B will appear. After updating the "Surface Observation" after release, the the correct release time should verified by looking at the "Raw PTU Tabular Display". If pressures after release are greater than the "Surface Pressure" the release time should be adjusted.

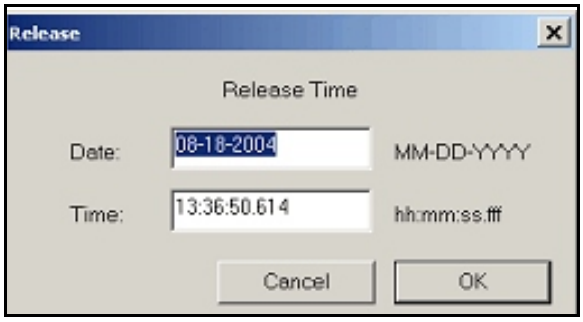


Exhibit 4-11B Change Release Time

NOTE: Changing the Release Time may greatly impact the data throughout the flight. Care must be taken when using this option.

3. Select the Change Termination Time option from the Tools options. A window similar to Exhibit 4-11C will appear. If ascent rates are too slow or too fast at flight termination or the data is considered inaccurate, this option should be used.

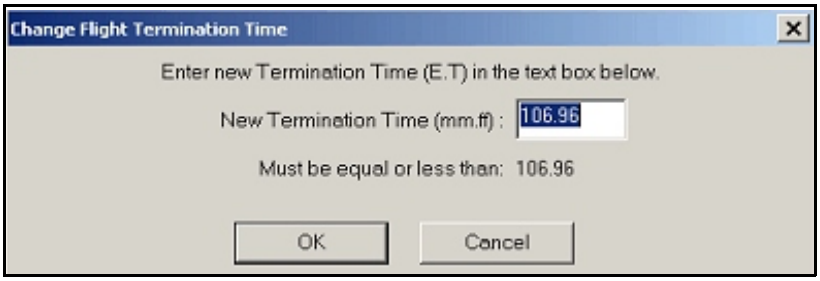


Exhibit 4-11C Change Termination Time

4. Select the Termination Reason option from the Tools options. Exhibit 4-11D should appear. To change the Termination Reason click on the left mouse button with the cursor over the block showing the termination reason, a drop-down list will appear. (See Exhibit 4-11E)

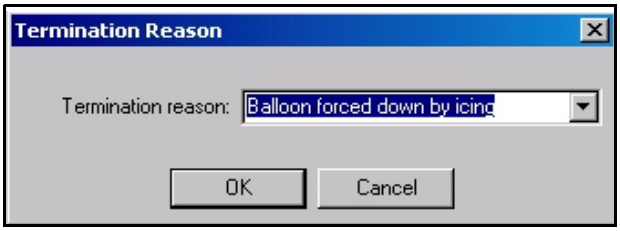


Exhibit 4-11D Change Termination Reason

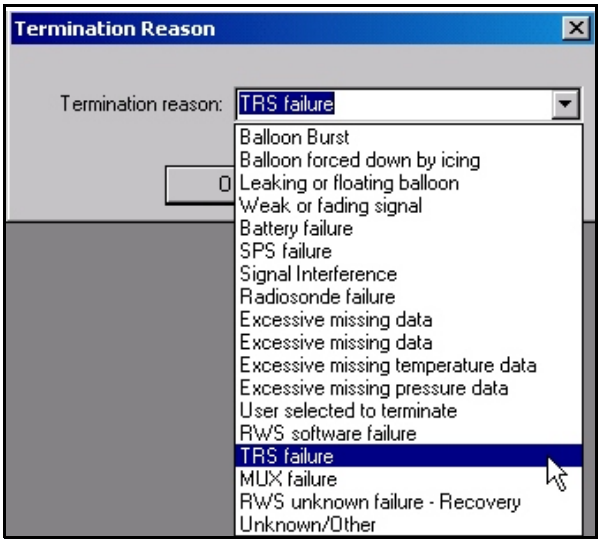


Exhibit 4-11E Reasons for Termination

4.2.7 Window Options

Clicking on the Window option provides a drop-down with three different options in Rework. (See Exhibit 4-12)

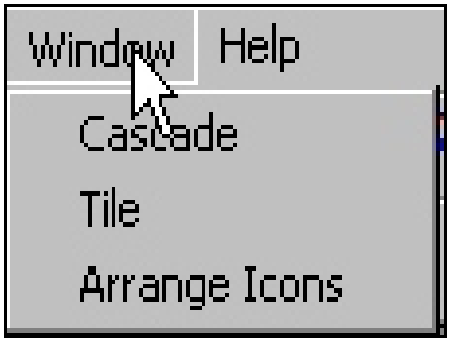


Exhibit 4-12 Window Options

NOTE: Open various displays and plots and use the Cascade, Tile and Arrange Icon options to view the displays and plots.

4.2.8 Help Options

Clicking on the Help option at the top of the RRS window provides a drop-down list with only a single item that is not grayed out. (See Exhibit 4-13) This Option is About RWS.

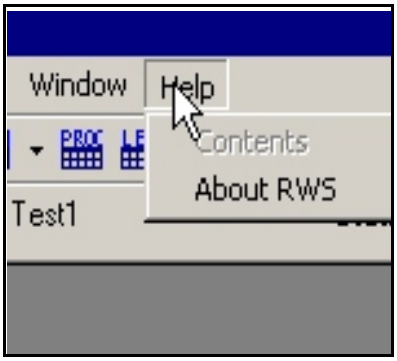


Exhibit 4-13 Help Options

1. Clicking on the About RWS option displays a window showing information including the version of RRS software being used. (See Exhibit 4-13A)

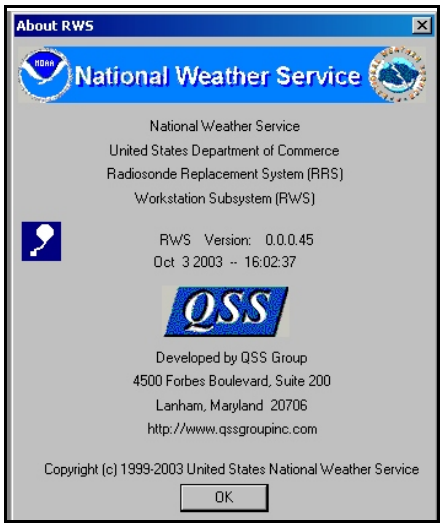


Exhibit 4-13A RWS Software Information

2. Clicking on the OK button will return you to the RWS Main window. Understanding the various options and learning which options allow you to effectively evaluate the data will vary among operators. However, each operator will quickly learn that continued evaluation of plots, along with check and status messages are key in this process.

4.2.9 Flight Options

Selecting the Flight Options during Rework allows the operator to utilize the Workspace Options, close the flight, or exit the RRS software. (See Exhibit 4-14)

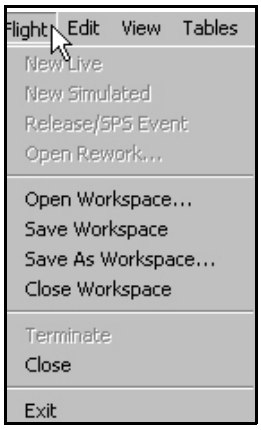


Exhibit 4-14 Flight Options

Selecting the Workspace Options allows the operator and the site to pre-select and save various windows and displays. Utilizing these options may help in data analysis and pre-selected screens can be used to provide vital troubleshooting information for maintenance personnel.

1. Go to the Flight Option and Select Open Workspace. (See Exhibit 4-14A)

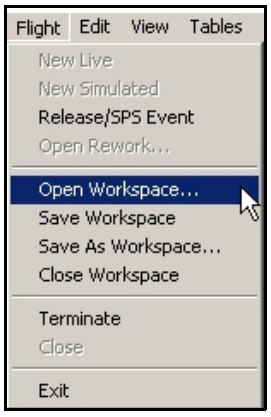


Exhibit 4-14A
Open Workspace

2. Window appears with workspace names that have been entered or allows the operator to create a new workspace name. Clicking on Plots and then click the "OK" button. (See Exhibit 4-14B) The default settings placed into the Plot workspace appears (See Exhibit 4-14C)

Exhibit 4-14B Selecting the Plots Workspace

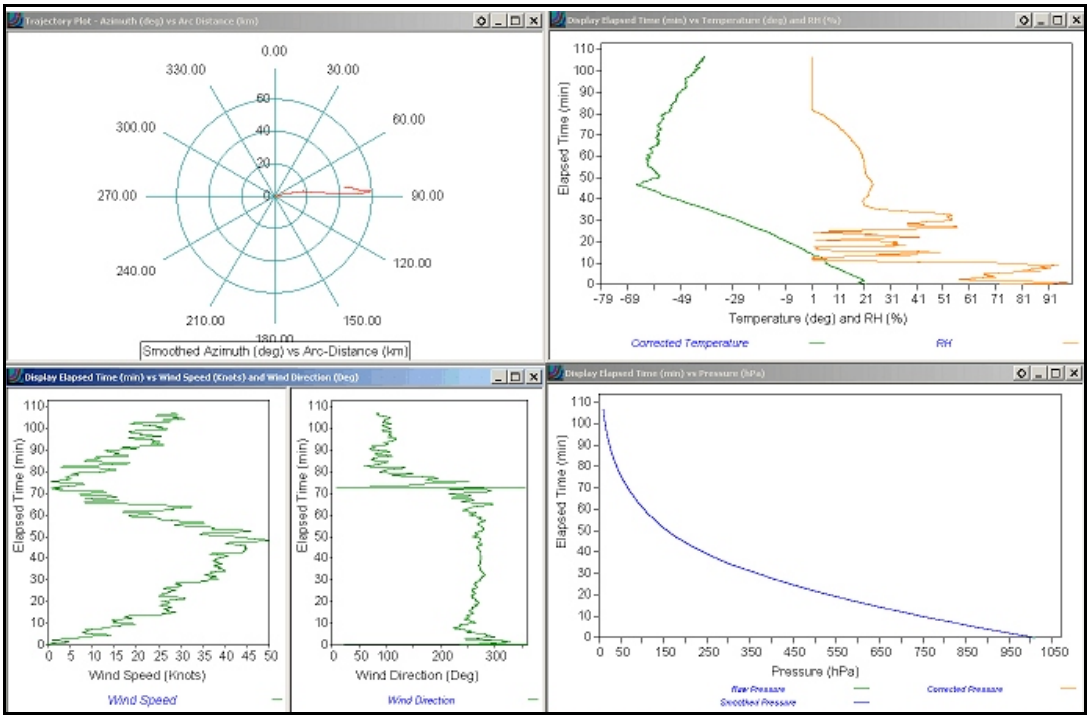


Exhibit 4-14C Plots Pre-selected in Workspace

3. Naming a new Workspace is done by selecting Open Workspace at the Flight Option, and then clicking on the Folder Icon to right of the Names List and typing in the desired workspace name. Click on the Open button to create a workspace. (See Exhibits 4-14D and 4-14E)

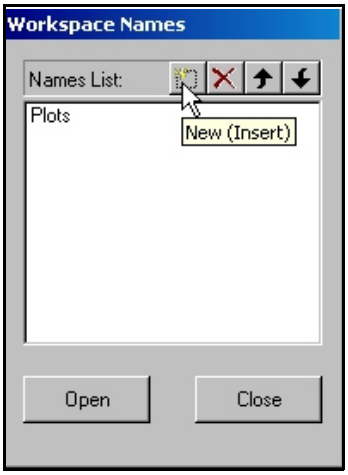


Exhibit 4-14D New Workspace

Exhibit 4-14E Typing Workspace Name

4. Next select the windows you would like to capture. (See Exhibit 4-14F) Then "Save" them into the Release workspace. (See Exhibit 4-14G)

NOTE: The Hardware Status Display, the Antenna Orientation/TRS Display and the GPS Status Window can not be captured to a Workspace.

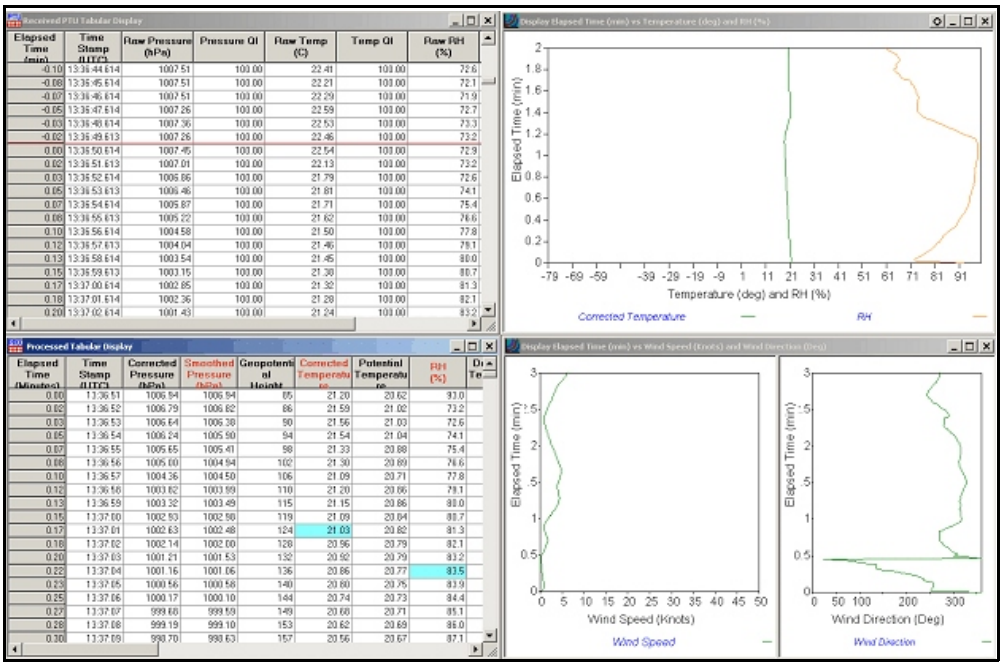


Exhibit 4-14F Screen Displays Selected for Release Workspace

5. If you wish to overwrite an existing workspace, click on the workspace and make changes to the displays you wish to make or you may open displays and then select the "Save Workspace" option.

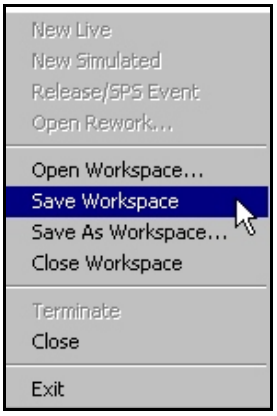


Exhibit 4-14G Save Workspace

NOTE: The Workspace option allows the operator to save his/her own desired workspace. Utilizing this option, the observer can save various workspaces for flight evaluation and analysis. However the configuration settings selected for the displays are not all saved. The Hardware Status, Antenna Orientation/TRS Display, and GPS Status Window are not saved in Workspace. The Time Interval selected is saved in the Processed Data Display, in the Plots, the Levels Overlay, Grids. (See Exhibit 4-14H)

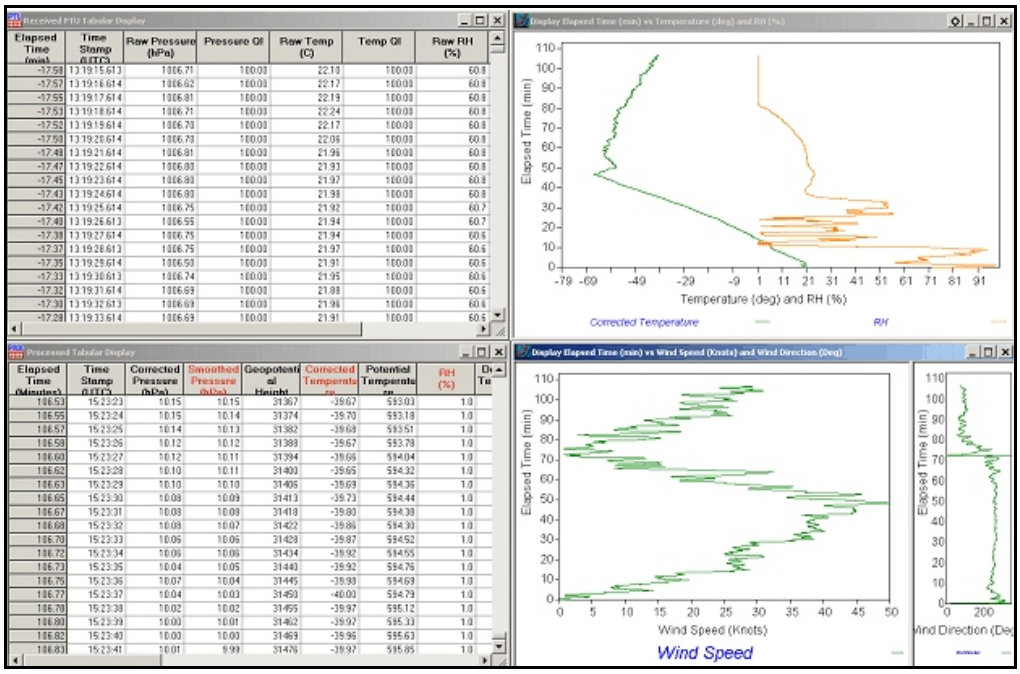


Exhibit 4-14H Release Workspace Recalled - Configuration Lost

5. Station Data

5.1 Introduction

The station resident data must be entered before the Observation function of RRS can be used. These data will be entered directly from a WSH database or by the Site Manager following instructions in Section 5.3. The only items an operator might need to change are the Balloon Gas, Surface Observation Equipment Type, and the Radiosonde Type. Once the data have been entered, updates should be infrequent. Section 5.3 describes the updating process.

5.2 Station Data Display

The station resident data is used by the RRS software to ensure that data transmitted reflects the proper station data, radiosonde type, tracking method and equipment, along with communication header information. The station data consists of two sections. The left portion of the display is maintained by National Weather Service Headquarters (WSH). No changes may be made by site personnel to this section of the screen display unless received from WSH. The right portion of the screen display may be entered by the site administrator or operators. (See Exhibit 5-1)

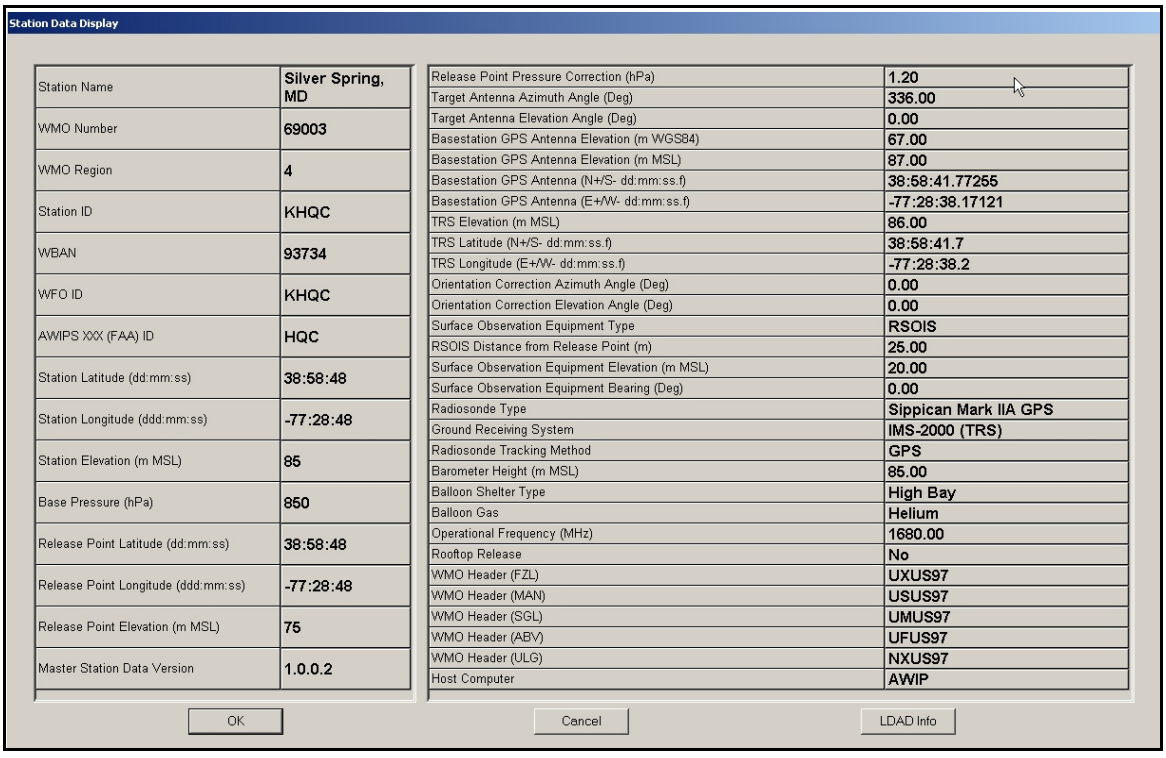


Exhibit 5-1 Station Data Display

5.2.1 National Weather Service Headquarters Maintained Data

The section on the left portion of the station data display contains basic information about the station that changes infrequently. This section's data is stored and updated only by National Weather Service Headquarters (WSH). The blocks include the Station Name, WMO Number, WMO Region, Station ID, WBAN, Latitude, Longitude, Elevation, etc. During installation, a site need only enter the proper WMO No. in the second block from the top to populate the remaining blocks on the left side of the station data display. (See Exhibit 5-2.)

Station Name	Silver Spring, MD
WMO Number	69003
WMO Region	4
Station ID	KHQC
WBAN	93734
WFO ID	KHQC
AWIPS XXX (FAA) ID	HQC
Station Latitude (dd:mm:ss)	38:58:48
Station Longitude (ddd:mm:ss)	-77:28:48
Station Elevation (m MSL)	85
Base Pressure (hPa)	850
Release Point Latitude (dd:mm:ss)	38:58:48
Release Point Longitude (ddd:mm:ss)	-77:28:48
Release Point Elevation (m MSL)	75
Master Station Data Version	1.0.0.2

Exhibit 5-2 WSH Maintained Data

NOTE: During RRS installation, a survey is done to ensure the Lat/Long and Elevation for the Release Point, Baseline Point and TRS are correct. Any corrections made are sent to the NWSH to update the Master Station Database.

5.2.2 Data Entered and Maintained by Station

The right section of the station data display is entered and maintained by the site administrator or operators. (See Exhibit 5-3) Accuracy of the information entered is essential and changes other than gas type, radiosonde type, and surface observation equipment are to be coordinated with the Region prior to implementation.

Release Point Pressure Correction (hPa)	1.20
Target Antenna Azimuth Angle (Deg)	336.00
Target Antenna Elevation Angle (Deg)	0.00
Basestation GPS Antenna Elevation (m WGS84)	67.00
Basestation GPS Antenna Elevation (m MSL)	87.00
Basestation GPS Antenna (N+/S- dd:mm:ss.f)	38:58:41.77255
Basestation GPS Antenna (E+/W- dd:mm:ss.f)	-77:28:38.17121
TRS Elevation (m MSL)	86.00
TRS Latitude (N+/S- dd:mm:ss.f)	38:58:41.7
TRS Longitude (E+/W- dd:mm:ss.f)	-77:28:38.2
Orientation Correction Azimuth Angle (Deg)	0.00
Orientation Correction Elevation Angle (Deg)	0.00
Surface Observation Equipment Type	RSOIS
RSOIS Distance from Release Point (m)	25.00
Surface Observation Equipment Elevation (m MSL)	20.00
Surface Observation Equipment Bearing (Deg)	0.00
Radiosonde Type	Sippican Mark IIA GPS
Ground Receiving System	IMS-2000 (TRS)
Radiosonde Tracking Method	GPS
Barometer Height (m MSL)	85.00
Balloon Shelter Type	High Bay
Balloon Gas	Helium
Operational Frequency (MHz)	1680.00
Rooftop Release	No
WMO Header (FZL)	UXUS97
WMO Header (MAN)	USUS97
WMO Header (SGL)	UMUS97
WMO Header (ABV)	UFUS97
WMO Header (ULG)	NXUS97
Host Computer	AWIP

Exhibit 5-3 Station Maintained Data

5.3 Entering Station Data

To enter the station data:

1. Turn on the RRS workstation computer and log in using your Username and Password. Users with an User Priority of "Trainee" or "Observer" may be placed in the "Captive Mode" by the Site Manager. Being Captive will automatically take them into the RWS Software. The Station Data is only viewable in the Live Flight and Rework Modes. (See Exhibit 5-5)

   NOTE: Trainees may enter the Offline, Simulated and Rework Flight Modes only. They are not authorized to enter the Live Flight Mode.

Exhibit 5-5 Options Window

2. Click on "Enter offline mode". (See Exhibit 5-5) The RWS Screen will appear as shown in Exhibit 5-6. Go to the top of the RWS Screen and click on "View" and then select the "Station Info" option as shown in Exhibit 5-6. Your Station Data Entry screen should appear similar to the example shown in Exhibit 5-7.

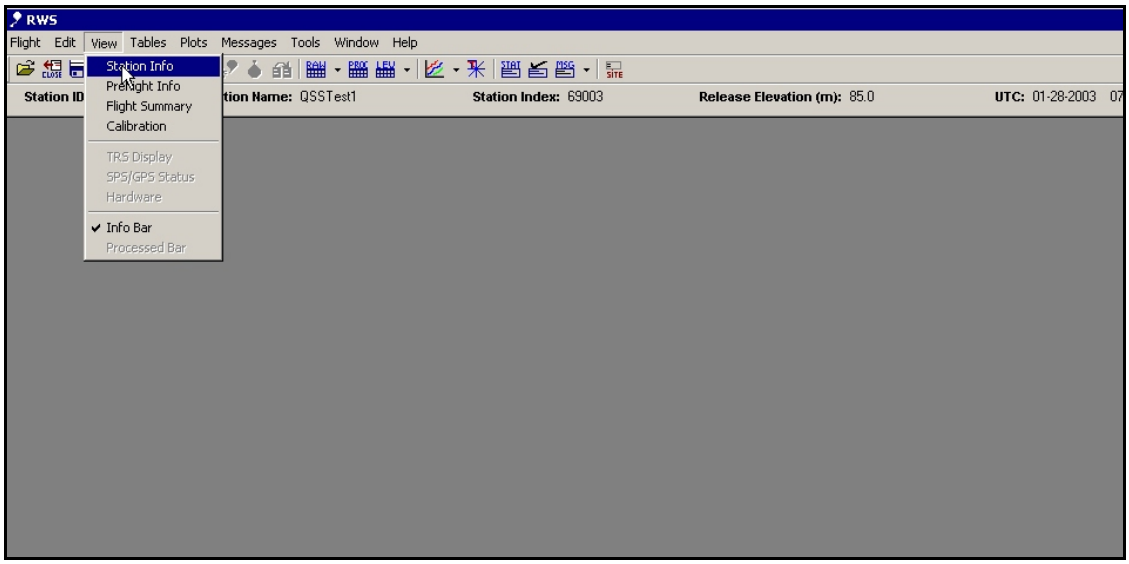


Exhibit 5-6 View Options

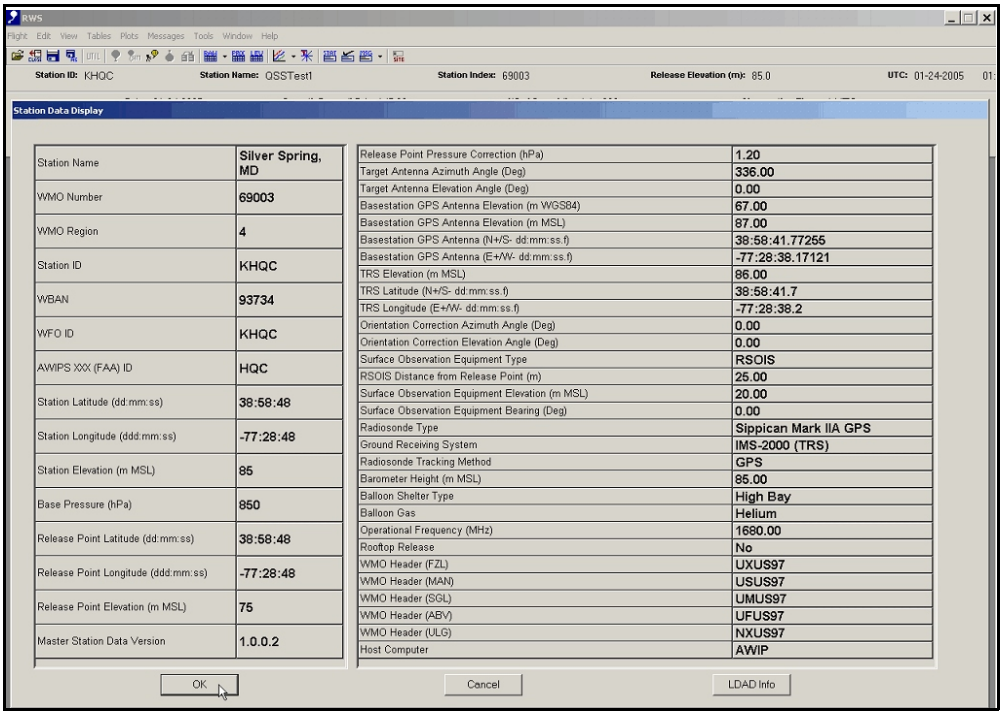


Exhibit 5-7 Station Data

5.3.1 Entering Individual Data Blocks

The entries in the right section of the Station Data Display may be entered by the site administrator or the operators. Any changes other than the Surface Observation Equipment Type, Balloon Gas, and Operating Frequency must be coordinated with the Regional Upper-Air Program Manager beforehand. It is important to remember changes in Latitude, Longitude, Elevation, Tracking System, Radiosonde Type, and others must be coordinated ahead of time to allow users to make the adjustments in their databases.

Entries may be made by moving the cursor over the appropriate block and then clicking the left mouse button. You may also use the up arrow and the shift tab keys. To move down by using the down arrow or the [Enter] key.

1. **Release Point Pressure Correction (hPa)** - Derived by finding the difference of elevation at the Station Elevation or baseline point and the release point. Enter to the nearest .1 hPa.

Correction: Added if the release point height is lower than the baseline height
Subtracted if the release point height is higher than the baseline height

NOTE: Release point height is the height of the inflation building's floor in meters + 1.2 meters. (Approximates the point where the instrument is typically released.)

Pressure Correction in hPa Applied to Radiosonde Baseline Station Pressure							
Barometer Height Minus Release Point Height (m)	Barometer Elevation in Meters Mean Sea Level						
	-.5 to 299.4	299.5-599.4	599.5-899.4	899.5-1199.4	1199.5-1499.4	1499.5-1799.4	1799.5-2199.4
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
4	0.5	0.5	0.4	0.4	0.4	0.4	0.4
5	0.6	0.6	0.6	0.6	0.5	0.5	0.5
6	0.7	0.7	0.7	0.7	0.6	0.6	0.6
7	0.8	0.8	0.8	0.8	0.7	0.7	0.7
8	0.9	0.9	0.9	0.9	0.8	0.8	0.8
9	1.1	1.1	1.0	1.0	1.0	0.9	0.9
10	1.2	1.2	1.1	1.1	1.1	1.0	1.0
11	1.3	1.3	1.2	1.2	1.2	1.1	1.1
12	1.4	1.4	1.3	1.3	1.3	1.2	1.2
13	1.6	1.5	1.5	1.4	1.4	1.3	1.3
14	1.7	1.6	1.6	1.5	1.5	1.4	1.4
15	1.8	1.7	1.7	1.7	1.6	1.5	1.5
26	3.1	3.0	2.9	2.8	2.7	2.7	2.6
27	3.2	3.1	3.0	2.9	2.8	2.8	2.7
28	3.3	3.2	3.1	3.0	3.0	2.9	2.8
29	3.4	3.3	3.2	3.2	3.1	3.0	2.9
30	3.6	3.5	3.4	3.3	3.2	3.1	3.0

Table 5-1 Pressure Correction for Difference in Baseline and Release Point Heights

2. **Target Antenna Azimuth Angle (Deg)** - Enter to the nearest .01 of a degree. Azimuth relative to True North. (RDF only)

3. **Target Antenna Elevation Angle (Deg)** - Enter to the nearest .01 of a degree. (RDF only)

4. **Basestation GPS Elevation (m WGS84)** - Enter to the nearest .1 of a meter above MSL.

5. **Basestation GPS Elevation (m MSL)** - Enter to the nearest .1 of a meter above MSL.
6. **Basestation GPS Latitude (N+S- ddmmss.f)** - Enter to the nearest .1 of a second.
7. **Basestation GPS Longitude (E+W- ddmmss.f)** - Enter to the nearest .1 of a second.
8. **TRS Elevation (msl)** - Enter to the nearest .1 of a meter above MSL.
9. **TRS Latitude (N+/S- ddmmss.f)** - Enter to the nearest .1 of a second.
10. **TRS Longitude (E+/W- ddmmss.f)** - Enter to the nearest .1 of a second.
11. **Orientation Correction Azimuth Angle (Deg)** - Enter to .01 degrees with RDF only
12. **Orientation Correction Elevation Angle (Deg**) - Enter to .01 degrees with RDF only
13. **Surface Observation Equipment Type** - Toggle Options (RSOIS and Other) If RSOIS is not installed or totally inoperative, use Other.
14. **RSOIS Distance from Release Point (m)** - To the nearest .1 of a meter.
15. **Surface Observation Equipment Elevation (m MSL)** - Elevation of the Temp/RH unit to the nearest .1 of a meter.
16. **Surface Observation Equipment Bearing (Deg)** - Enter to the nearest .01 relative to True North.
17. **Radiosonde Type** - Toggle Options (Sippican Mark IIA GPS and InterMet 3010 GPS)
18. **Ground Receiving System** - Toggle Options -IMS-2000 (TRS), IMS-1500C, and Other
19. **Radiosonde Tracking Method** - Toggle Options (GPS and RDF)
20. **Barometer Height (m MSL)** - Enter the baseline height to the nearest .1 meters. This is the Station Elevation. Height of barometer and baseline point should be the same.
21. **Balloon Shelter Type** - Toggle Options (High Bay, Low Bay, BILS, Roof-Top BILS, and Not Specified)
22. **Balloon Gas** - Toggle Options (Hydrogen, Helium, and Natural Gas)
23. **Operating Frequencies (MHz)** - Operator entered value - Allowable Values (1676 MHz, 1678 MHz, 1680 MHz and 1682 MHz)
24. **Rooftop Release** - Toggle Options (YES and NO)
25. **WMO Header (FZL)** - Header for RADAT or Freezing Level Header information
26. **WMO Header (MAN)** - Header for Mandatory Levels SFC - 100 hPa
27. **WMO Header (SGL)** - Header for Significant Levels SFC - 100 hPa
28. **WMO Header (ABV)** -Header for Levels Above 100 hPa
29. **WMO Header (ULG)** - Header for Significant Levels Above 100 hPa
30. **Computer Host** - AWIP only option

5.4 LDAD Information

This information is required to ensure the coded messages are transmitted. The communication parameters allow the site to send the messages via the LAN or phone lines.

1. Clicking on the "LDAD Info." Button at the bottom of the Station Data Display allows the observer to see the communication options available. (See Exhibit 5-8)

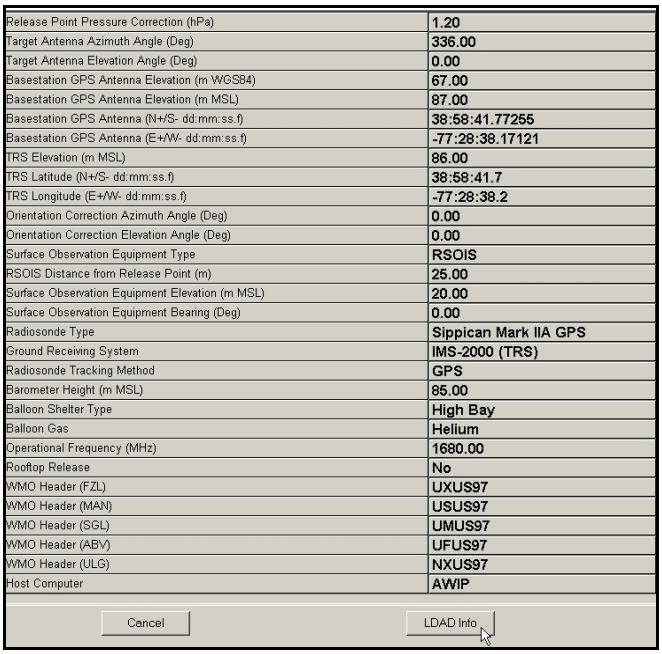


Exhibit 5-8 Updating LDAD Information

2. The following window appears after the LDAD Info button is clicked upon. This window shows the LAN and multiple Phone lines options available.

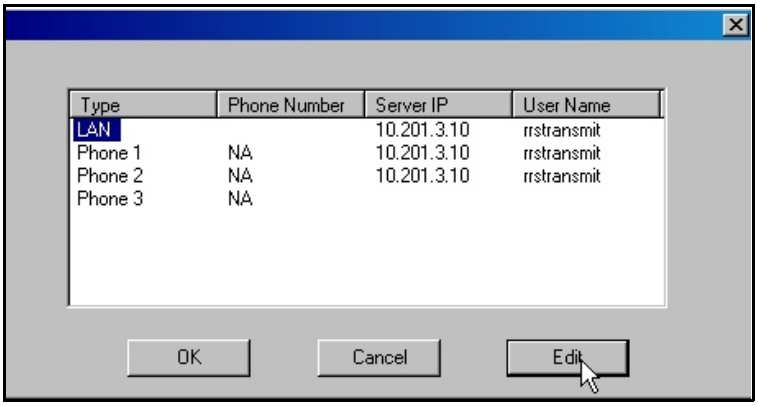


Exhibit 5-9 LAN and Phone Line Options

3. Selecting the type of communication line to edit or enter the data required is done by clicking the Edit button. The following windows appears if the LAN or a Phone line option is selected. This information must be set by the Site Manager. This option is not available to User's having a Trainee or Observer User profile.

Exhibit 5-9 LAN Entries

Exhibit 5-10 Phone Entries

NOTE: If the LAN is down, the software will try each dial-up line 3 times prior to going to the next each additional backup line.

6. RWS Software Utilities

6.1 Introduction

The RWS software allows the users to go into the Tools option and select Utilities in the Offline mode. The RWS Software Utilities has three major subsets. (See Exhibit 6-1) They are:

Flight Management Utilities
Application Utilities
Administrative Utilities

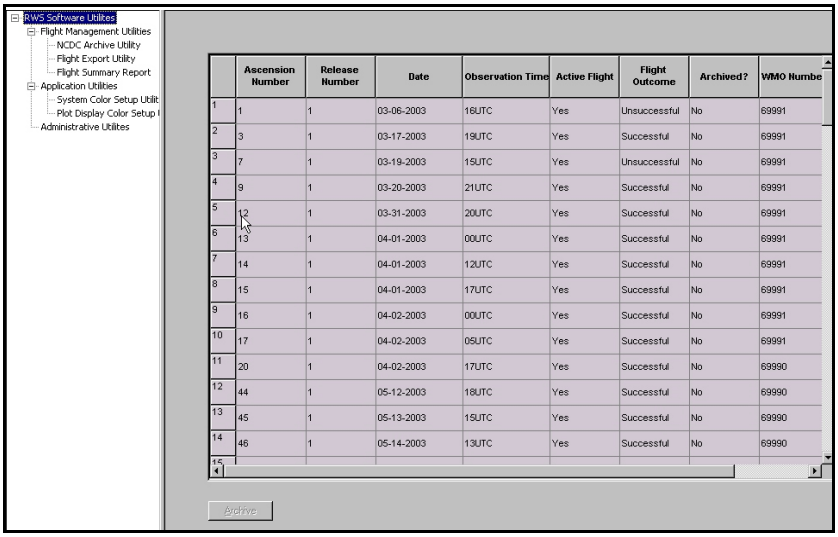
Utilities are used by the operator to accomplish numerous tasks and functions, such as archival, export, and system setup. The Site Manager or Site Administrator is allowed to accomplish other tasks that are not covered in this user's guide.

6.2 Flight Management Utilities

The Flight Management Utilities has three options. The observer or administrator may enter the following utilities or tool areas:

NCDC Archive Utility
Flight Export Utility
Flight Summary Utility

NOTE: Selecting a flight to archive or export requires the operator to click on the far left column for the flight or ascension number desired, and then click the "Archive" or "Export" button.



	Ascension Number	Release Number	Date	Observation Time	Active Flight	Flight Outcome	Archived?	WMO Numbe
1	1	1	03-06-2003	16UTC	Yes	Unsuccessful	No	69991
2	3	1	03-17-2003	19UTC	Yes	Successful	No	69991
3	7	1	03-19-2003	15UTC	Yes	Unsuccessful	No	69991
4	9	1	03-20-2003	21UTC	Yes	Successful	No	69991
5	12	1	03-31-2003	20UTC	Yes	Successful	No	69991
6	13	1	04-01-2003	00UTC	Yes	Successful	No	69991
7	14	1	04-01-2003	12UTC	Yes	Successful	No	69991
8	15	1	04-01-2003	17UTC	Yes	Successful	No	69991
9	16	1	04-02-2003	00UTC	Yes	Successful	No	69991
10	17	1	04-02-2003	05UTC	Yes	Successful	No	69991
11	20	1	04-02-2003	17UTC	Yes	Successful	No	69990
12	44	1	05-12-2003	18UTC	Yes	Successful	No	69990
13	45	1	05-13-2003	15UTC	Yes	Successful	No	69990
14	46	1	05-14-2003	13UTC	Yes	Successful	No	69990
15								

Exhibit 6-1 RWS Software Utilities

6.2.1 NCDC Archive Utility

Click on the NCDC Archive Utility option, Exhibit 6-2 appears. This utility allows the operator to see which flights have or have not been archived and also indicates which flights were successful or unsuccessful.

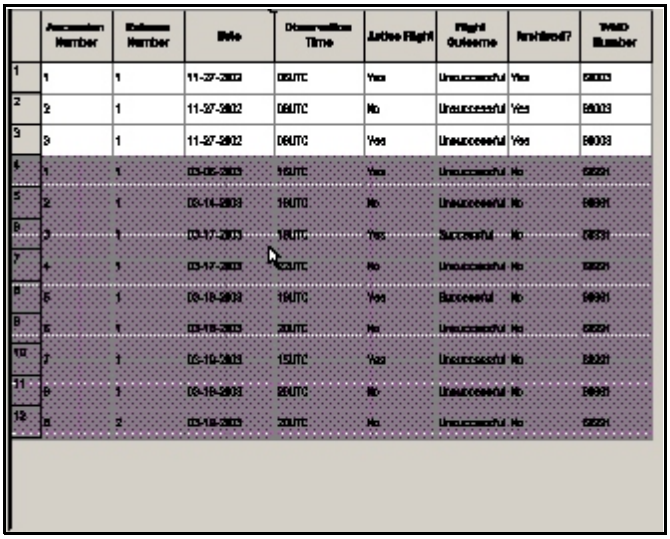
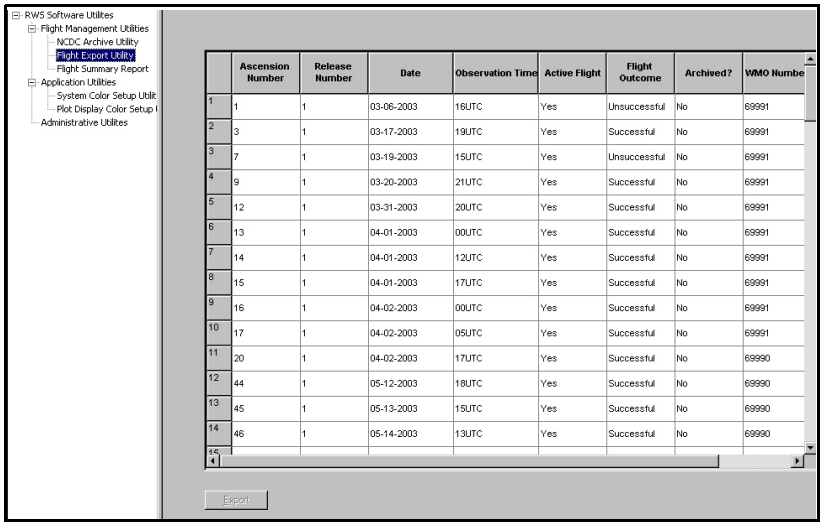


Exhibit 6-2 Archive Window

NOTE: Flights from other sites are grayed out. They can not be archived.

6.2.2 Flight Export Utility

Click on the Flight Export utility, Exhibit 6-3 appears. The operator may enter this utility to send a file or flight information to another subdirectory or location.



	Ascension Number	Release Number	Date	Observation Time	Active Flight	Flight Outcome	Archived?	WMO Numbe
1	1	1	03-06-2003	16UTC	Yes	Unsuccessful	No	69991
2	3	1	03-17-2003	19UTC	Yes	Successful	No	69991
3	7	1	03-19-2003	15UTC	Yes	Unsuccessful	No	69991
4	9	1	03-20-2003	21UTC	Yes	Successful	No	69991
5	12	1	03-31-2003	20UTC	Yes	Successful	No	69991
6	13	1	04-01-2003	00UTC	Yes	Successful	No	69991
7	14	1	04-01-2003	12UTC	Yes	Successful	No	69991
8	15	1	04-01-2003	17UTC	Yes	Successful	No	69991
9	16	1	04-02-2003	00UTC	Yes	Successful	No	69991
10	17	1	04-02-2003	05UTC	Yes	Successful	No	69991
11	20	1	04-02-2003	17UTC	Yes	Successful	No	69990
12	44	1	05-12-2003	18UTC	Yes	Successful	No	69990
13	45	1	05-13-2003	15UTC	Yes	Successful	No	69990
14	46	1	05-14-2003	13UTC	Yes	Successful	No	69990

Exhibit 6-3 Flight Export Utility

6.2.3 Flight Summary Utility

Click on the Flight Summary utility, a window similar to Exhibit 6-5 will appear. This utility allows the operator to view a Flight Summary file from any of the flights that have been stored. This is an excellent tool for determining site performance and a quick way to look at flights that may have had problems or need special attention.

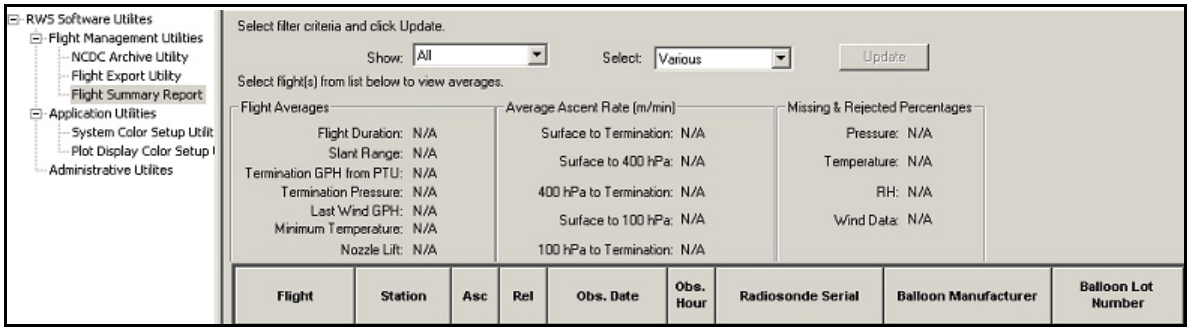


Exhibit 6-5 Flight Summary Selection Window

6.2.3.1 Flight Summary Options

At the top of Flight Summary Selection Window two different options may be used to select the type of flights to review or the month the flight was flown. After selecting the type of flights and the months, click on the "Update" button to list the flights meeting the selections chosen. (See Exhibits 6-5A and 6-5B)

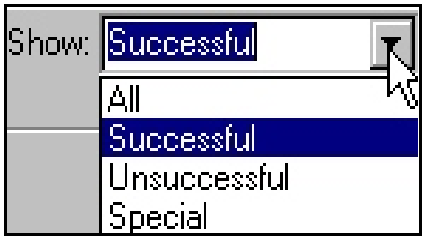


Exhibit 6-5A Types of Flights

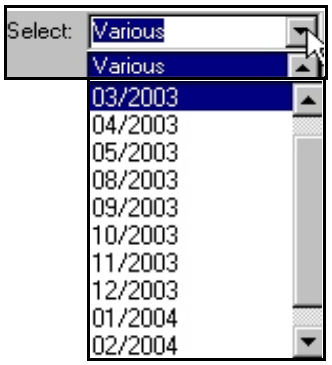


Exhibit 6-5B Month of Flight

6.2.3.2 Individual Flight Summary Display

The individual Flight Summary Report shows critical flight performance data. Select a flight, then click on the View button. A Flight Summary display similar to Exhibit 6-6 will appear.

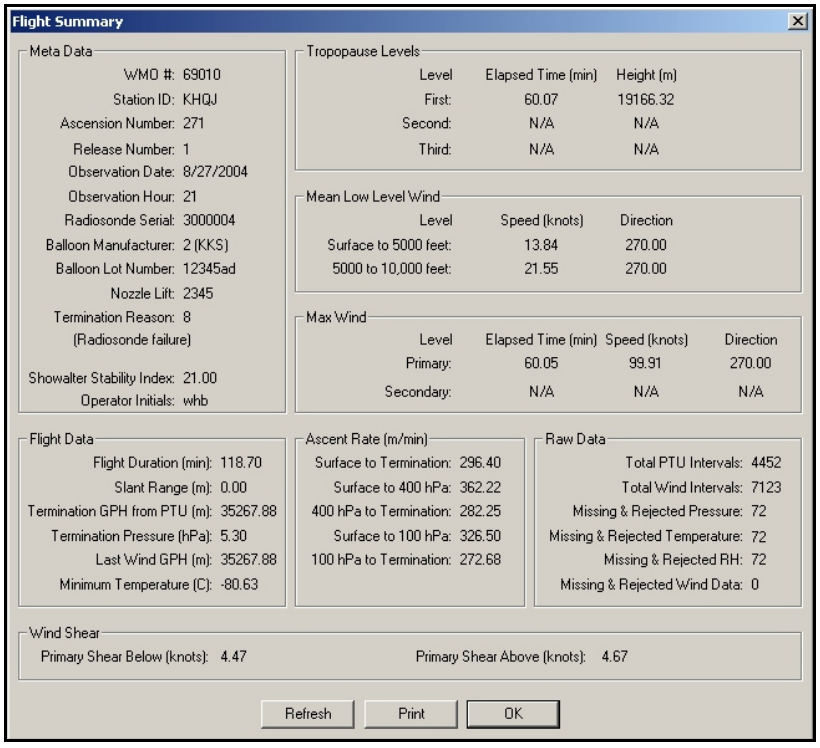


Exhibit 6-6 Flight Summary Display

6.3 Application Utilities

The Application Utilities allows the user to look at the color setup being used with the system for tabular data and plots. The administrator and operator may change these profiles. The two options are System Color Setup and Plot Display Color Setup. (See Exhibits 6-7 and 6-8) Changing colors requires only to click the left mouse button on the desired color, a window appears, and then select the color you wish. .

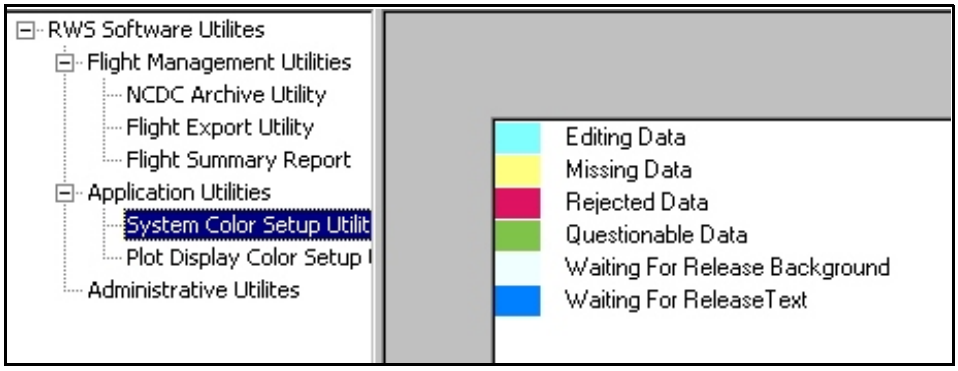


Exhibit 6-7 System Color Setup

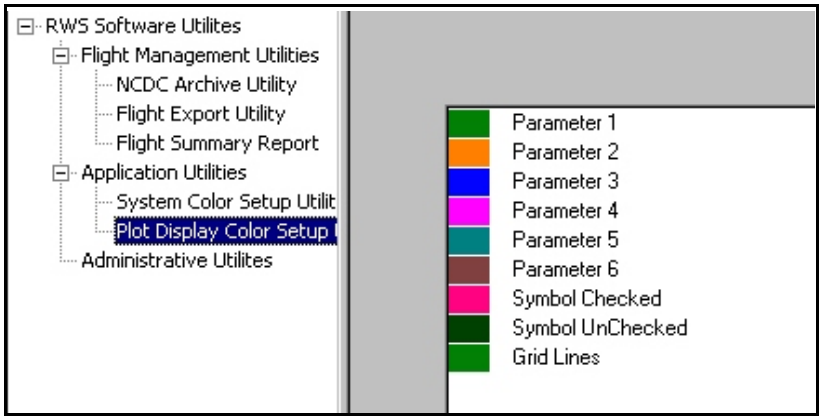


Exhibit 6-8 Plot Display Color Setup

NOTE: Each observer may change the system and plot colors. The change will not affect other users.

Parameter 1	On all plots - The far left parameter descriptor
Parameter 2	On all plots - The 2nd parameter descriptor from the left
Parameter 3	The 3rd parameter descriptor from the left or if only 2 parameters shown - It will be used for an overlay plot
Parameter 4	The 4th parameter descriptor from the left or if 3 parameters shown - It will be used for an overlay plot
Parameter 5	The 5th parameter descriptor from the left or if 4 parameters shown - It will be used for an overlay plot
Parameter 6	The 6th parameter descriptor from the left or if 5 parameters shown - It will be used for an overlay plot
Symbol Checked	
Symbol Unchecked	
Grid Lines	Horizontal or vertical grid lines

Exhibit 6-9 Parameter Description

NOTE: Changing the color of the grid lines will change both horizontal and vertical grid lines.

6.4 Administrative Utilities

The Administrative Utilities is not accessible to the trainee or operator.

7. Checking the System Status

7.1 Introduction

This chapter describes the hardware status checks. These checks **must** be performed before every flight. The checks may not be necessary for second and third releases if the known reason for the flight failure was other than hardware.. The hardware checks ensure the Signal Processing System (SPS), Global Positioning System (GPS), Telemetry Receiver System (TRS), the Radiosonde Surface Observing Instrumentation System (RSOIS), the Precision Digital Barometer (PDB), the printer, the Local Area Network (LAN), and the modem are functioning properly. The operator may check the Hardware Status and SPS Status displays at anytime during or after a flight, or when working in the offline mode.

7.2 Getting Started

To start the Hardware Status Check, follow these steps:

1. Turn on the RRS workstation and log in with the assigned User Name and Password.

2. The RWS will automatically start and the Security Warning window appears. Read and click [Ok] to continue. (See Exhibit 7-1)

NOTE: Trainees will automatically be taken into the RRS software program.

NOTE: Ensure the TRS and SPS equipment are on and have been allowed a minimum of 30 minutes to warm-up prior to starting the Baseline Check.

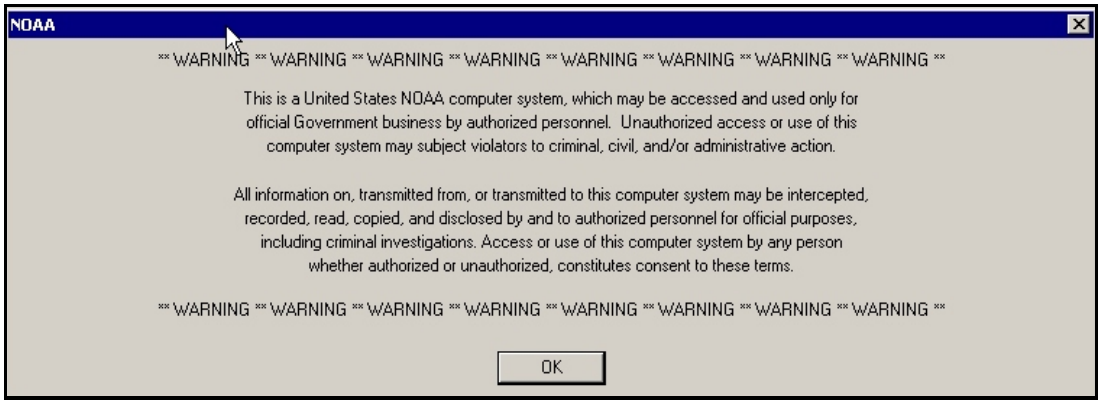


Exhibit 7-1 Security Warning Window

3. If it has been more than 12 hours since the last observation, the following window will appear. (See Exhibit 7-2A) Clicking "No" will bring the software to Exhibit 7-3. If the operator clicks "Yes" Exhibit 7-2B appears allowing a "No Data Message" to be generated by selecting the proper 101 groups from the drop-down list.

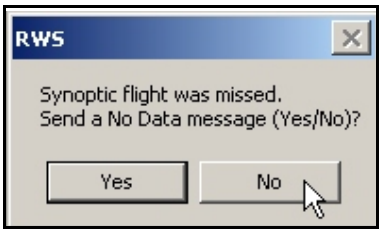


Exhibit 7-2A Missed Flight Window

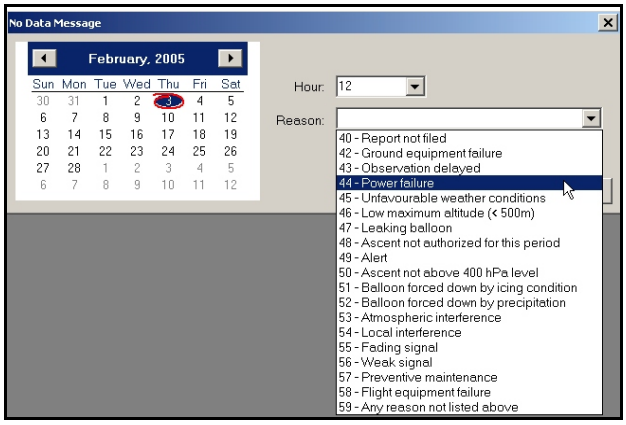


Exhibit 7-2B No Data Message Display with 101 Group Drop-down List

4. The Flight Option Window will appear and the Live Flight Option should be selected. (See Exhibit 7-3)

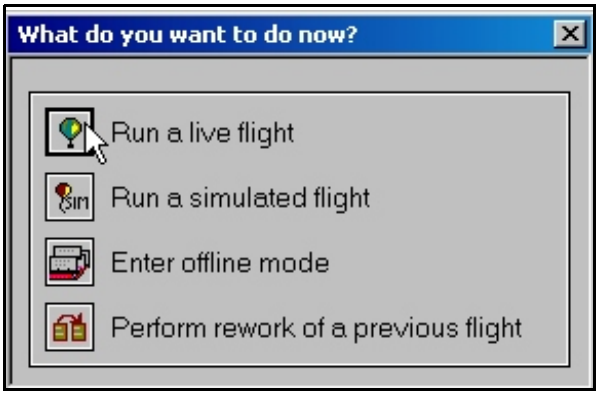


Exhibit 7-3 Flight Option Window

5. The Hardware Status window appears (Exhibit 7-4). A warm-up period is required for the equipment and it is dependent on temperature. During cold periods a wait of at least 20 minutes may be necessary for all equipment checks to turn green. If any of the equipment status checks fail, close the window and retry. If the equipment continues to fail, print or capture the Hardware Status display, and the contact the electronics technician.

NOTE: The SPS and GPS will have a clock icon until the baseline check. The PDB is shown Beyond Tolerance at startup due to not being connected for this flight. The PDB will also show Beyond Tolerance when the pressure is changing rapidly. ("Burst Mode On")

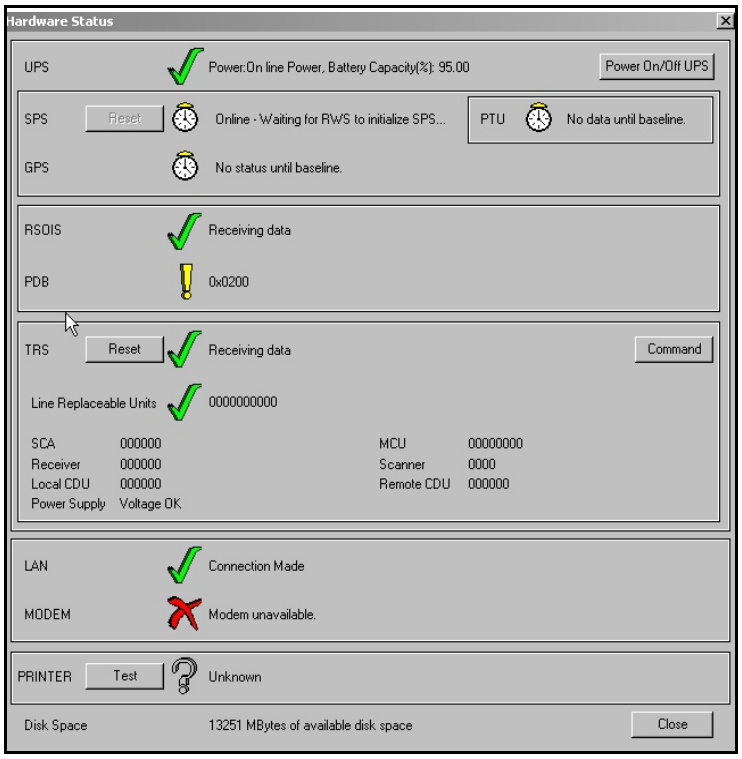
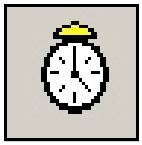


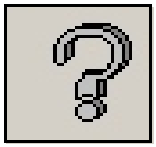
Exhibit 7-4 Hardware Status Window

Hardware Status Icons:

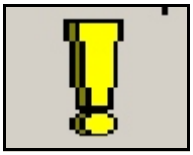
Passed



Waiting



Unknown



Beyond Tolerance

Failed

The Hardware Status display indicates the status of the following hardware items:

UPS	(May be On/Off, Battery, Trim and Boost)
SPS	(May be Online, Waiting for RWS,)
GPS	(Will indicate "Waiting" until baselining the sonde)
RSOIS	(Receiving or Not Receiving Data)
PDB	(Beyond Tolerance - Exceeds Normal Parameters or Conditions)
TRS	(May Reset - Has Line Replaceable Units (LRU's)
LAN	(Connection Made or Unsuccessful)
MODEM	(Available or Unavailable)
PRINTER	(May Test)
DISK SPACE	(Shows Available Disk Space)

Uninterruptible Power Supply (UPS) - Located in the Radome with the TRS. The UPS ensures reliable power is supplied to the system in case of a power failure or fluctuation. The UPS provides at least 10 minutes of power to operate the entire TRS and launch area components. The battery capacity (0 - 100%) will be indicated to the right of the UPS Status Icon.

When the Hardware Status Display appears a message will appear requesting the operator to turn on the UPS. (See Exhibit 7-5A)

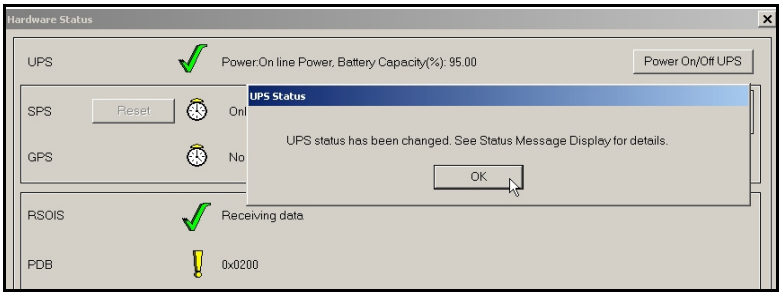


Exhibit 7-5A UPS Status Window within Hardware Status Display

Clicking the OK button in the window will turn the UPS on and generate a Status Message. (See Exhibits 7-5B)

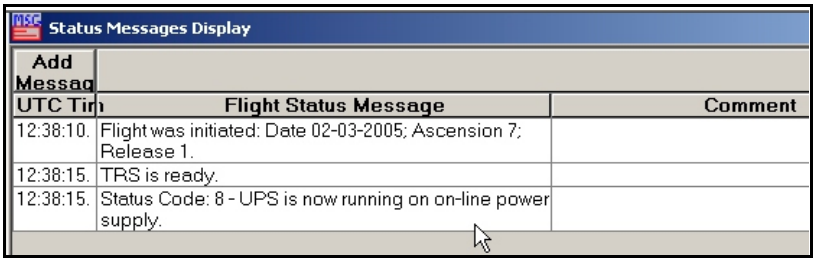


Exhibit 7-5B UPS Status Message within Status Message Display

It is important to remember that any time the UPS changes status a UPS Window will appear signaling the change and a Status Message will be generated. At flight termination the Window will appear and will not turn the UPS off without the operator clicking the OK button.

Signal Processing System (SPS) - The TRS is designed to receive telemetry from any radiosonde that meets the RRS requirements. The TRS delivers the radiosonde telemetry signal as a 10.7 MHz IF to the SPS. Each radiosonde requires a compatible SPS that will convert its unique signal into a standard format required by the workstation. SPS is checked at baseline.

Global Positioning System (GPS) - The GPS ground receiver provides position calculations to the SPS. The GPS is checked during the baseline process for the numbers of satellites received and accuracy of position data as compared to site position information stored in the station data file.

Radiosonde Surface Observing Instrumentation System (RSOIS) - Automated sensors located within 200 meters of the release point. Sensors include Temperature, RH, Wind Speed and Direction. If the RSOIS is inoperative or not used, in the Station Data Display enter "Other". Entries that are missing or in error must be manually editted by the operator.

Precision Digital Barometer (PDB) - Located within 15 feet of the RRS workstation and at the same height as the baseline height. This instrument provides the pressure measurements used to compare the instrument pressure sensors accuracy during the baseline check.

Telemetry Receiver System (TRS) - The TRS consists of three units. The Antenna Unit, the TRS Workstation Unit, and the Launch Area Unit. The Hardware Status checks the Antenna and the TRS Workstation only. If a fault or problem exists a Hardware Status Icon other than a green check mark will be shown along with a non-zero hexidecimal code to the right of the respective component. During warmup, 9999999999 will be to the right of the LRU Status Icon. The nines will change to all zeroes once initialization is complete and all components check out trouble free. Remember a warm-up period is temperature dependent. Extended warm-up times may be expected at sites with very cold temperatures. Any time warmup exceeds 30 minutes follow trouble shooting procedures in Appendix E.

Besides noting the status of each hardware component, the Telemetry Receiver System (TRS) indicates a status for each Line Replaceable Unit (LRU). (See Exhibit 7-6) If a problem exists with any of the LRU's, the numbers to the right will indicate digits other than zero. Print or capture the Hardware Status display and contact the electronics technician.

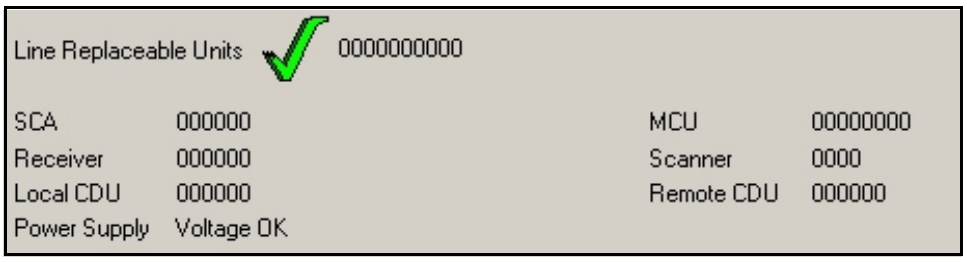


Exhibit 7-6 Line Replaceable Units within the TRS

Local Area Network (LAN) - Hardware Status Check will validate the connection to the LAN is operational.

MODEM - Hardware Status Check will validate the connection if a modem is available.

7.3 Printer Test

The printer test normally takes no more than a few seconds. If the Test button is pressed the Printer Status indicator should indicate a green check mark and within a few seconds print a test page. If the printer is non-functional a red "X" will appear.

If the printer is not ready for use, a question mark or red "X" will appear.

7.4 SPS Status Window

This window shows the number of satellites being received by the GPS receiver and the radiosonde. (See Exhibit 7-7) A minimum of 4 matches are required to process winds and gather height information. The circles to the right of the SPS and GPS letters must be green for GPS lock to receive positional data. If the circles do not turn green and the Match number does not reach 4 or more within 200 seconds of beginning baseline, reinitialize the SPS and wait a minimum of 2 minutes.

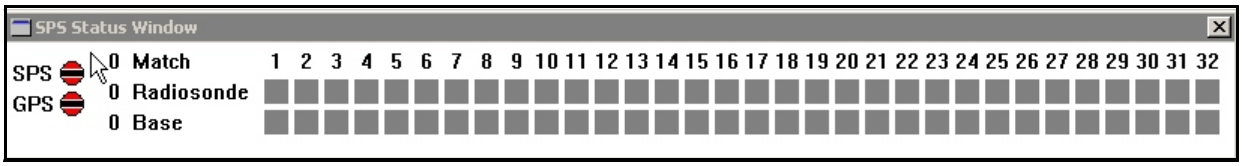


Exhibit 7-7 SPS Status Window

NOTE: This window will show no meaningful information prior to baseline.

7.5 Gathering Specific Data for Fault Isolation

NOTE: Prior to gathering data, if the Hardware Status window continues to indicate a problem Reset the SPS, TRS or UPS.

If resetting the equipment does not work, print or capture the Hardware Status display, notify the electronics technician, and enter a problem report into the Engineering Management Reporting System (EMRS). If the problem does not prevent the flight continue the Pre-flight process.

If time permits or at a later time, close the RRS software and open the RRS Offline Maintenance software. Using the basic instructions from Appendix C, the operator may be able to assist the electronics technician in isolating the problem. This activity is expected to be a routine function for sites in Alaska and the Pacific without electronic technicians and at sites when maintenance is not readily available such as at night or during weekends.

8. RRS Observation - Prerelease Sequence

8.1 Introduction

This chapter describes the prerelease sequence of a RRS upper air observation. Before beginning this chapter, the System Status Check (Chapter 7) should have been reviewed.

The prerelease sequence consists of three steps:

a. Completing the prerelease data

b. Baselining the radiosonde

c. Preparing for Balloon Launch

The following sections deal with these steps.

8.2 Completing the Prerelease Data

Completing the prerelease data is the first step in the prerelease sequence. These data provide information about the time, flight equipment, radiosonde, and surface weather. (Chapter 3 provides an introduction to entering these data using the Simulated Flight option.)

NOTE: Before beginning this procedure, the station data must be entered. It is essential that this information is accurate.

Check with the Station Manager or Site Administrator to have the station resident data entered. (Chapter 5 provides instructions for entering the station resident data.)

Follow these steps to complete the prerelease data:

NOTE: Be sure to allow for enough time for equipment warmup prior to beginning the Pre-Release sequence. In cold temperatures, this may require more than 20 minutes. The warmup begins after the Hardware Status Screen appears and the UPS is turned on. ***The TRS equipment should be turned on at least 30 minutes before baseline.***

1. After running the Hardware Status checks, the RWS Main Window appears with the Administrative Data Display, the Antenna Orientation/TRS Display, and the Status Message Display. (See Exhibit 8-1) Allow the "Status" window on the Antenna Orientation/TRS Display to go through the Warm-up and Initialization sequence, then move the antenna by slewing the antenna or entering values into the Azimuth and Elevation windows before filling in the Administrative Data Display.

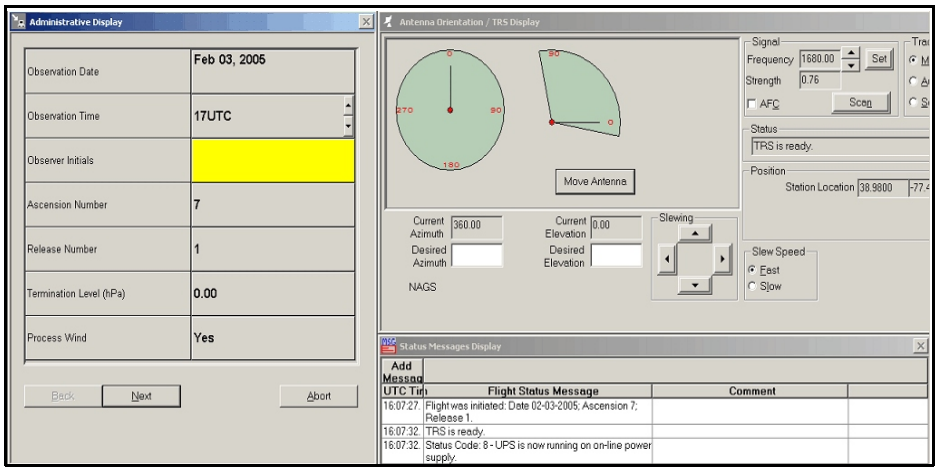


Exhibit 8-1 Admin/Antenna & TRS/Status Message Displays

NOTE: RRS does not require antenna orientation. The equipment should start with the antenna pointing North and at 0 degrees elevation. If not, advise maintenance.

2. Validating the TRS has completed the "Warm-up" and "Initialization" are critical. The Antenna Orientation/TRS Display has a Status window below the Frequency Adjustment and Signal Strength windows.

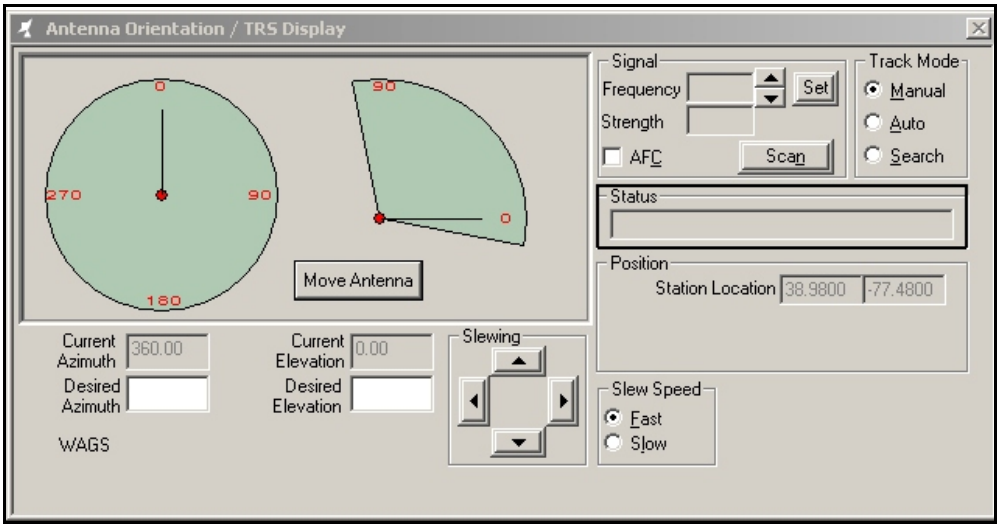


Exhibit 8-2 Status Bar within the Antenna Orientation/TRS Display

The Status Messages will come up with the following displays:

Exhibit 8-3 The **"TRS Reset in progress"** message stays up for only a few seconds.

Exhibit 8-3 Status Bar During TRS Reset

Exhibit 8-4 The **"TRS Reset warm-up in progress**" message may stay up for 20 minutes or more during very cold temperatures. If the equipment is already warmed-up, it may not show.

Exhibit 8-4 Status Bar During TRS Warm-up

Exhibit 8-5 **"The TRS Reset init in progress**" message comes up for approximately 30 seconds and disappears.

Exhibit 8-5 Status Bar During TRS Initialization

NOTE: Be sure to allow for enough time for equipment warmup prior to beginning the Pre-Release sequence. In cold temperatures, this may require more than 20 minutes. The warmup begins after the Hardware Status Screen appears and the UPS is turned on.

3. After the Status Bar has gone through the 3 stages, go to the Antenna Orientation/TRS Display and move the antenna to ensure the antenna is not in the suspend mode. (See Exhibit 8-6)

NOTE: When the warmup is completed, the "Status Bar" should show "TRS is Ready".

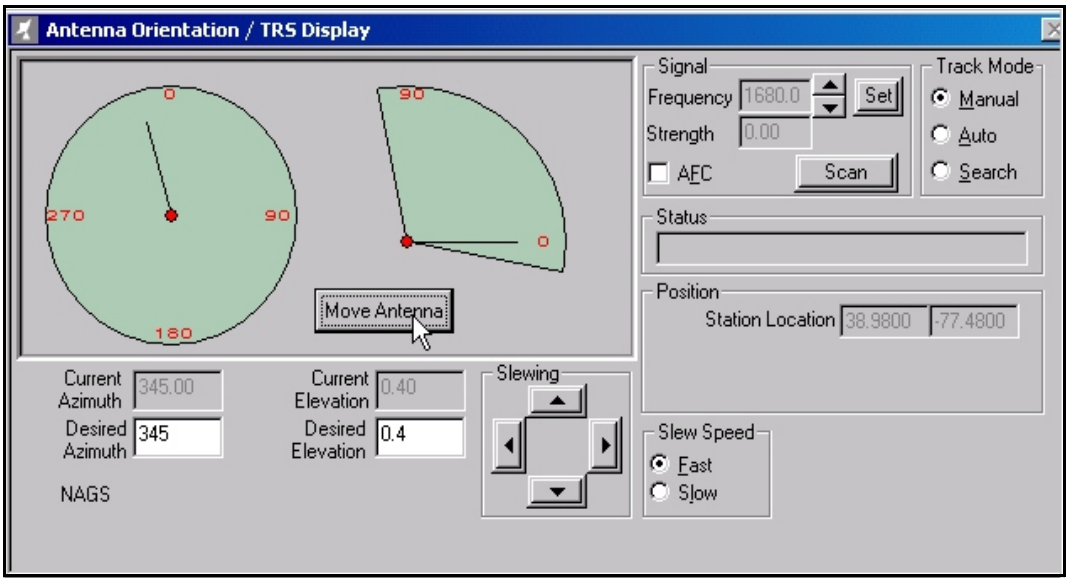


Exhibit 8-6 Move Antenna Prior to Baseline

NOTE: The Desired Azimuth and Desired Elevation fields are grayed out until the TRS has initialized or the antenna is in the suspend mode.

4. After verifying the antenna tracking by moving the antenna, go ahead and begin filling in the Administrative Data Display. (See Exhibit 8-7)

5. The Administrative Data Display's blocks for Date and Time are taken from the date and time set within the workstation. This time needs to be kept updated by the Site Manager or Site Administrator. The clock must be set to Universal Time Coordinated (UTC). (See Exhibit 8-7)

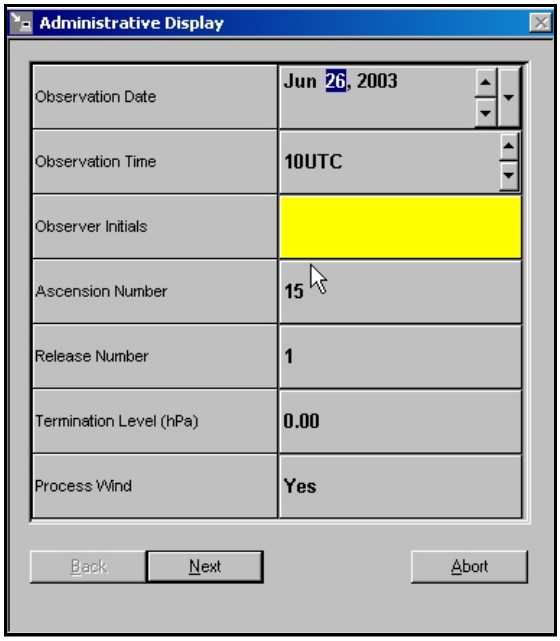


Exhibit 8-7 Date/Time Entries

6. Manually click on the up or down arrows in the date and time blocks to alter the entries provided by the software. The Date block allows the operator to move the cursor over the Month, Day, or Year and then click the up or down arrow to alter the entry. An error message will appear, if the entries are not the same day or not within an hour of the time the software indicates. (See Exhibit 8-8)

Exhibit 8-8 Date/Time Alert

7. When entering your initials, the software requires a minimum of 2 and up to a maximum of 4 letters. It will not allow numbers or any other deviations.

8. The Ascension Number is automatically entered by the software and can not be altered. The release number is triggered by the software and will update if a flight terminates early and the observer elects to do another release. The software will allow a maximum of 3 releases with an ascension number.

9. The Termination Level block allows only entries between 0.00 hPa to 400 hPa. Any terminations desired prior to reaching 400 hPa will not be accepted. Any entries outside this range will generate an error message alerting the observer.

10. The Process Wind block default is "Yes" for GPS flights. After clicking the Next button the Equipment Display appears. (See Exhibit 8-9)

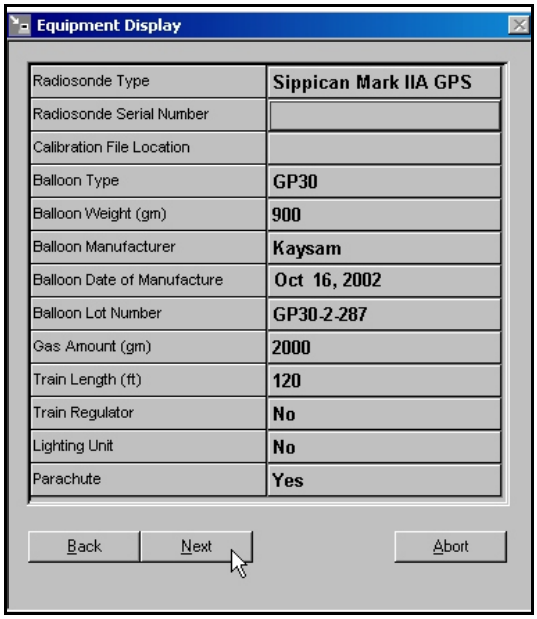


Exhibit 8-9 Equipment Display

11. The Equipment Display provides detailed information of the radiosonde, balloon, amount of gas, and the flight train. All this information is useful when analyzing the flight data.

12. The Radiosonde Type block is determined from the Station Data file entry. Additional radiosondes besides Sippican are expected to be qualified and they will be entered through the Station Data File under the Radiosonde Type drop-down.

13. The Radiosonde Serial Number and Calibration File Location blocks do not need to be filled in with the Sippican radiosonde. This instrument transmits the serial number and calibration data during baseline. The serial number and other pertinent information is located on a label at the bottom of the radiosonde.

14. Select Balloon Type from the clickable drop-down. (See Exhibit 8-10)

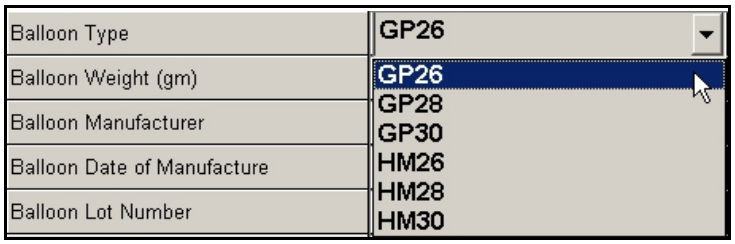


Exhibit 8-10 Balloon Type Dropdown

15. The Balloon Weight block requires an entry of 300 to 2500 grams. When the Balloon Type is entered, the appropriate weight is automatically entered. The entry may be edited. Any entries outside this range will generate an error message and are not accepted.

16. The Balloon Manufacturer block allows the operator to choose from a drop-down list. (See Exhibit 8-11)

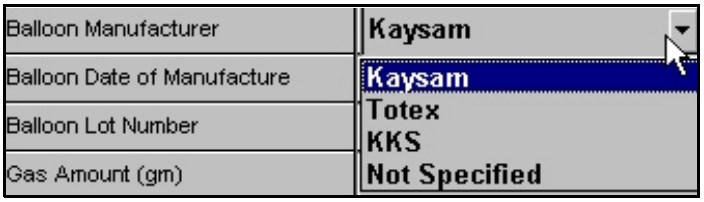


Exhibit 8-11 Balloon Manufacturer Options

17. The Date of Manufacture block has an up/down arrow that may be used after placing the cursor over the Month, Date, or Year and then clicking the up or down arrow. (See Exhibit 8-12)

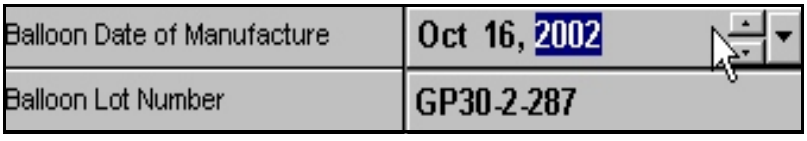


Exhibit 8-12 Date of Manufacture/Balloon Lot Number

18. The Date of Manufacture and the Lot Number block are related. The breakdown for the Balloon Lot Number is:

    TTSS-Y-DDD

TT - Type of balloon only allowable entries are:

    GP - General Purpose
    HM - High Modulus

SS - Size of the balloon is what minimum burst altitude is expected from the balloon in kilometers (km). Acceptable entries are:

    26 - 26 km balloon either GP or HM
    28 - 28km balloon either GP or HM
    30 - 30km balloon either GP or HM

Y - Is the last digit in the year of manufacture. Example: 2003 would be 3

DDD - Is the Julian date for the date of manufacture. Beginning from the first of the year.

Example: The Julian date for April 8th for a non-leap year would be 98 (January has 31 days, February has 28 days, March has 31 days, and 8 days in April.)

19. The Gas Amount block is the grams of "**Nozzle Lift**" placed in the balloon. Acceptable values are 300 to 5000; anything else will generate an error message.

Nozzle Lift: Is the total amount of gas placed in the balloon minus the gas required to lift the balloon by itself. Typically this value will be 1300 to 2000 depending on the weather conditions and type of radiosonde used.

20. Train Length block - Values entered must be between 70 and 120 feet.

21. Train Regulator, Lighting Unit, and Parachute are all entries that require either a Yes or No. If you click inside the block a down arrow will appear. Click the desired response.

    NOTE: All sites are required to use a parachute unless a special waiver has been granted by WSH. Sites granted this waiver are extremely remote sites in the Alaskan and Pacific Regions.

22 Click **"Next"** at the bottom of the Equipment Display.

23. The Surface Observation Display appears. It is initially blank, but may be populated by manually entering data or hitting the **"Refresh"** button to have the values from RSOIS and the PDB entered into the blocks. (See Exhibits 8-13 and 8-14)

NOTE: Surface Wetbulb is derived no need to manually input.

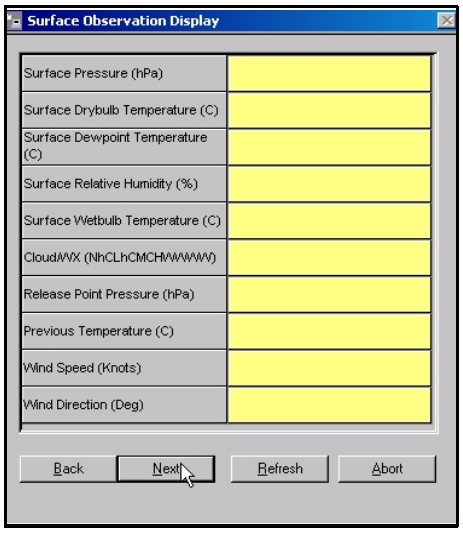


Exhibit 8-13 Blank SFC Observation Display

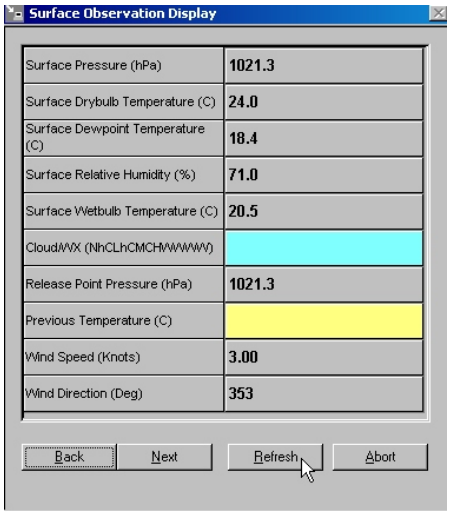


Exhibit 8-14 Refreshed SFC Observation Display

24. Entering the blocks manually provides the observer with feedback and error messages if the entries are outside the acceptable range.

a.	The Surface Pressure - Accepts values:	750 to 1070 hPa
b.	The Surface Drybulb Temperature - Accepts values:	-55 to 45 C
c.	The Surface Dewpoint Temperature - Accepts values:	-135 to 35 C
d.	The Surface Relative Humidity - Accepts values:	0 to 100 %
e.	The Surface Wetbulb Temperature - Accepts values:	-55 to 45 C

25 The Cloud/WX (NhCLhCMCHWWWW) Block - Requires 9 digits to be entered. The same present weather code may be entered twice if the weather is unchanging. The Cloud/WX Block accepts only numbers or / and must comply with the instructions in Appendix B.

NOTE: It is essential that the cloud group be entered accurately. The software applies a solar radiation correction algorithm based on the cloud group entered.

26. The Release Point Pressure Block - Generates from the Surface Pressure entry and the known height difference between the baseline point the release point height in the Station Data.

27. Previous Temperature Block only needs to be entered if the Surface Pressure is less than 1000 hPa. Enter the temperature 12 hours ago. Acceptable values are -100 to 50 C.

28. Wind Speed Block - Accepts values from 0 to 50 knots.

29. Wind Direction Block - Accepts values from 1 to 360 degrees.

30. After all data is entered into the appropriate boxes, go to the Antenna Orientation/TRS Display and move the antenna to the proper Azimuth and Elevation prior to the radiosonde baseline. These fields are grayed out until the TRS has initialized. (See Exhibit 8-15)

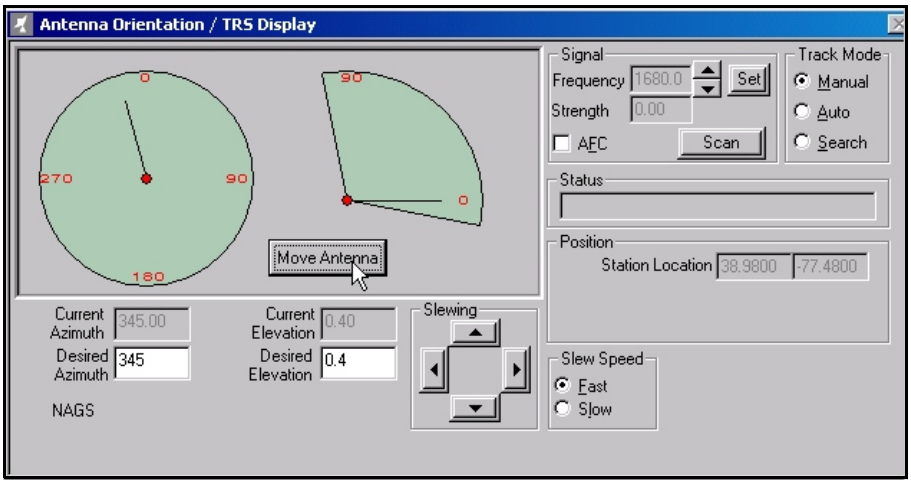


Exhibit 8-15 Move Antenna Prior to Baseline

31. After setting the radiosonde's frequency, point the antenna at the baseline location, ensure the battery has been activated and connected to the radiosonde the minimum 5 minutes. Manually "Set" the frequency. Then click on the "AFC" button. Signal strength should be over 50. (See Exhibit 8-16) or (See Exhibit 8-17)

NOTE: Manually setting the frequency prior to baseline is essential when doing a second or third release. This is done to ensure the calibration data from a previous instrument is not used during the baseline process. Remember, calibration data is transmitted from the instrument.

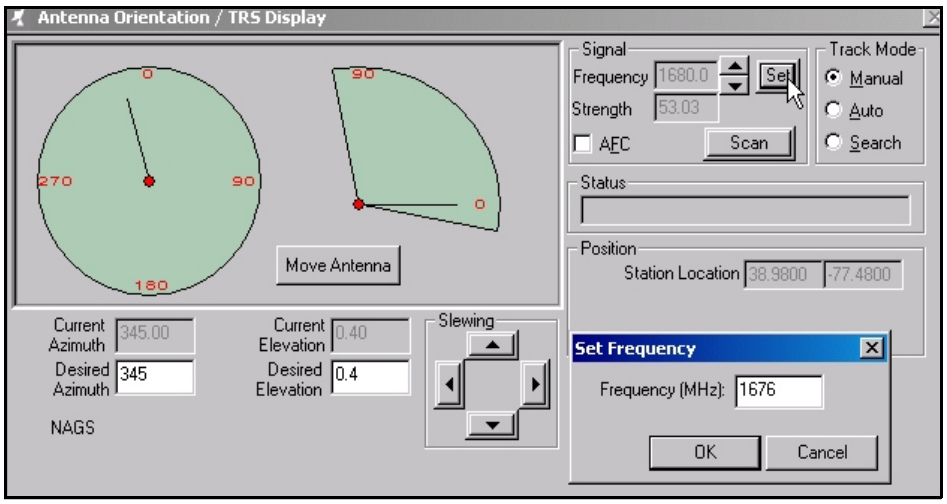


Exhibit 8-16 Manually Setting Frequency prior to Baseline

NOTE: Often the radiosonde will be off one of the 4 allowable frequencies by .1 to .2 MHz. Be sure to check the "AFC" box to ensure the TRS is locked on the precise frequency for maximum signal.

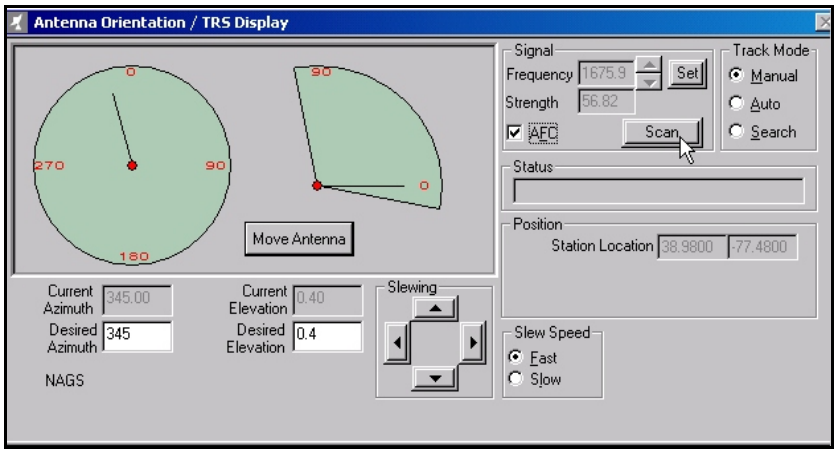


Exhibit 8-17 If 2nd or 3rd Release Never Use "Scan" Button

32. After ensuring the antenna is positioned properly and the signal is locked-on to the radiosonde frequency, wait to just prior to leaving the building to click the **"Next"** button on the bottom of the Surface Observation Display**.** Baseline will begin!

NOTE: The baseline process should be delayed until just prior to release to ensure the pressure discrepancy applied is as accurate as possible to the actual conditions at release. If the surface conditions change after starting baseline, hit the "Back" button to return to the Surface Observation Display and enter the correct data.

8.3 Baselining the Radiosonde

1. The Baseline Display appears and begins the baseline process. (See Exhibit 8-18) Wait until at least 10 frames are received and if the data looks consistent, click on the **"Calculate"** button. (See Exhibit 8-19) Ensure you have GPS prior to calculating.

NOTE: If the Baseline process can not be completed because the SPS does not initialize or you do not get GPS lock within 4 minutes, follow procedures in Appendix E (Section E2.4).

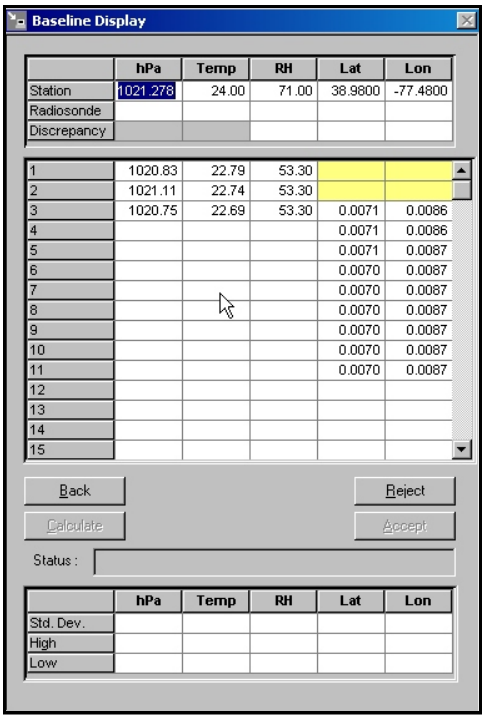


Exhibit 8-18 Baseline in Process

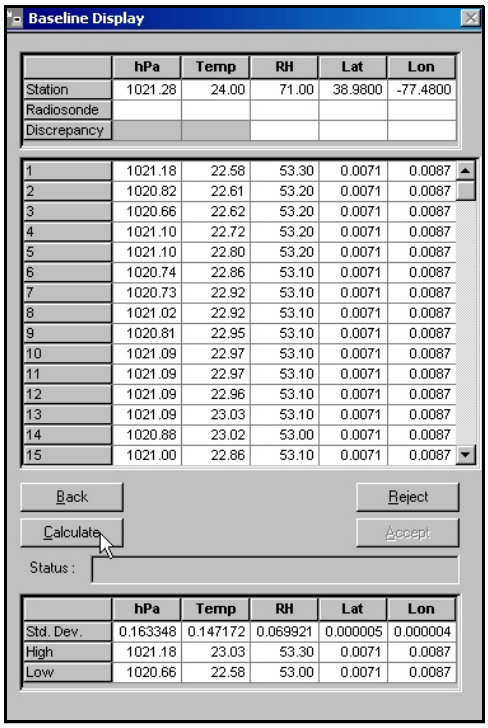


Exhibit 8-19 Baseline Ready to Run Calculate

2. After clicking the **"Calculate"** button the Pressure Discrepancy and differences in the Latitude and Longitude are shown. The pressure discrepancy must be within $\pm$ 5 hPa to pass the baseline process. The Temperature and RH values reflect the average conditions where the radiosonde is baselined.

3. After clicking the **"Accept"** button (See Exhibit 8-20), the window asking if you wish to continue appears. (See Exhibit 8-21) Ensure the GPS winds are available. There should be a minimum of 4 matches between the Radiosonde and Base to compute heights..

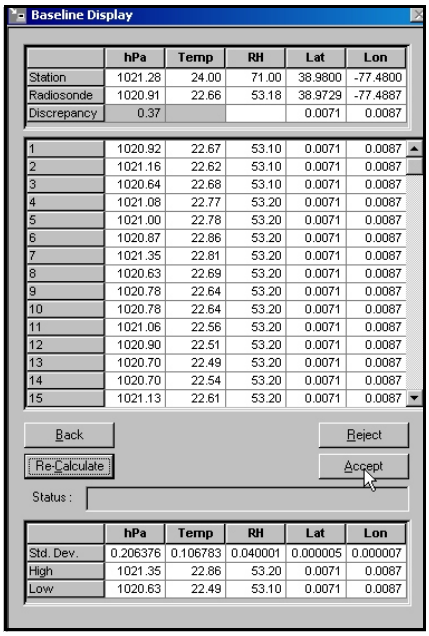


Exhibit 8-20 Accept Baseline

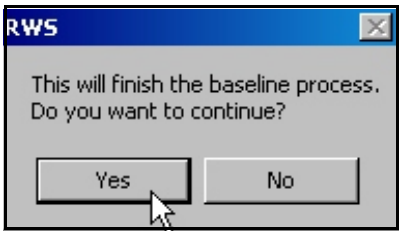
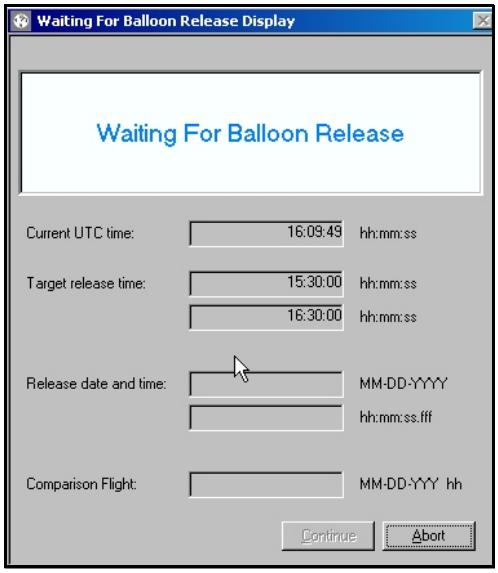


Exhibit 8-21 Continue Flight

4. Click the **"Yes"** button on the "This will finish the baseline process" window to have the "Waiting For Balloon Release Display" appear. (See Exhibit 8-22)



8-22 Waiting for Balloon Release

NOTE: Prior to leaving the office to go to the inflation building, check the "Status Bar" at the bottom of the screen to ensure the instrument is transmitting realistic pressure, temperature and relative humidity values (See Exhibit 8-23)

Exhibit 8-23 Status Bar with Current Radiosonde PTU Values

8.4 Preparation for Launch

Ensure all conditions are right for launch. Prior to leaving the office, check the constant pressure charts, NEXRAD, and/or wind profilers for the wind directions above your location. Using the Antenna Orientation/TRS Window point the antenna in the direction the wind is expected to take the balloon and leave the antenna in the Manual mode. At the release shelter, use the CDU to verify the signal strength, antenna position, GPS lock-on, and re-checking the weather conditions prior to launch. ***Never release into a thunderstorm, wait until it passes or do not make a release.*** If everything is fine, call for clearance if within 5 nautical miles of a controlled airfield.

1. Release the balloon. The software automatically detects launch by the decrease in pressure. If this function should fail the backup is to have someone click on the **"Yellow Balloon"** icon at the top of the RWS Main window to activate the launch. (See Exhibit 8-24)

Exhibit 8-24 Manual or Simulated Balloon Release

NOTE: It is vital that the frequency and signal strength be checked prior to and immediately after release. This should be done using the CDU at the release site. It is also important to ensure the antenna is operational and tracking properly by using the CDU. If the antenna does not respond to "Move" commands. The operator may hold the "Move" key for 4-5 seconds to re-engage the antenna control. For additional details read Appendix E (Section E2.2) and Chapter 3 of WSOH-10 and A.

2. After the launch, the Balloon Release Display appears. (See Exhibit 8-25) Click the "Continue" button.

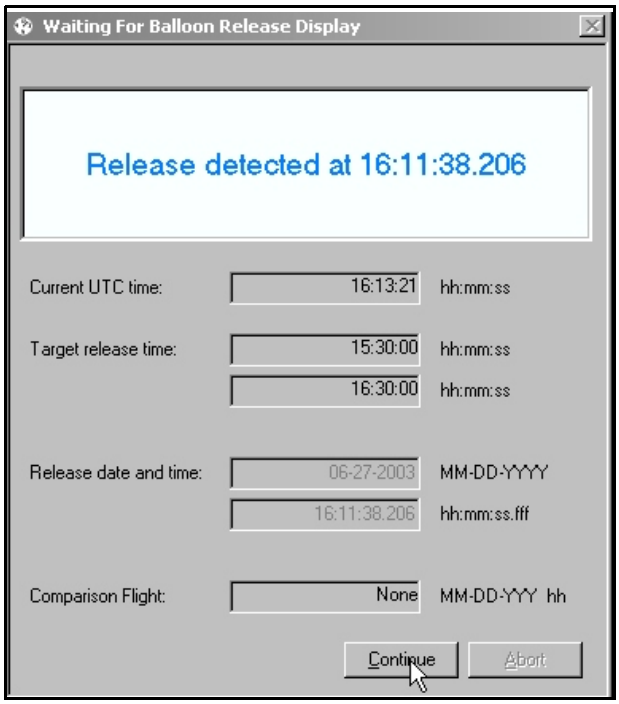


Exhibit 8-25 Balloon Release Detected

3. After clicking the "Continue" button, the Surface Observation Display appears. Check the Surface Observation data, and make changes if needed. Then click the "OK" button to continue. (See Exhibit 8-26)

NOTE: An observation may be changed by the observer anytime during or after the flight and also in Rework. This is to ensure the surface observation data used is accurate and changed if inaccurate data was initially used. However, it is important to remember than any data markings will be lost if the Surface Observation is changed. This is why it is important to re-verify the Surface Observation immediately after release.

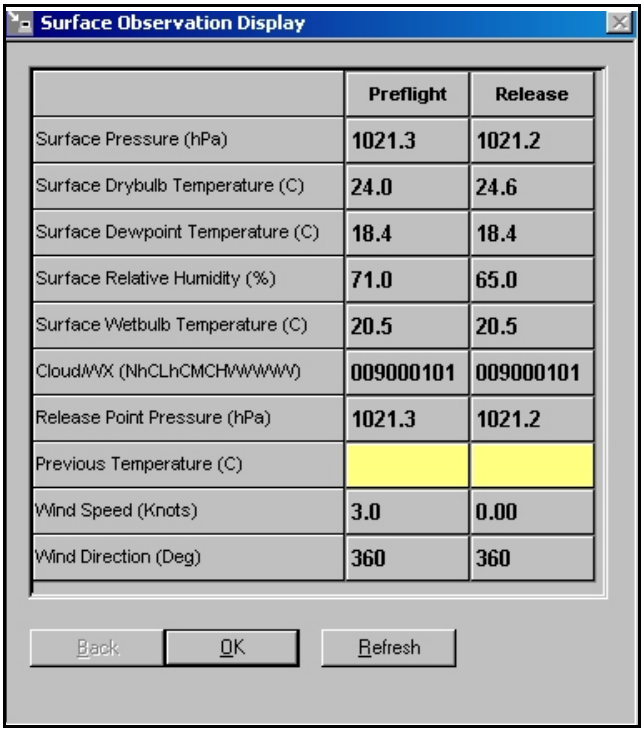


Exhibit 8-26 Surface Observation Display

NOTE: After closing the Surface Observation Display, if GPS is being received the operator may at the Antenna Orientation/TRS Display place the antenna in the Search mode. The antenna will automatically track to the last known GPS location.

CAUTION: If GPS is not being received, do not activate the Search mode. The antenna will be unable to find the signal because there is no GPS. This is why it is vital to know what the wind directions are above your location. Check the upper level charts and the wind profile from NEXRAD or wind profiler prior to launch. You may need to manually position the antenna if signal is lost due to a tracking problem.

9. RRS Observation - Checking and Editing Data

9.1 Introduction

This chapter describes the procedures for checking data and editing erroneous flight data during a typical RRS observation. Included are data editing commands and techniques for dealing with some of the more common problems that arise during a flight. Refer to Chapter 13 for handling significant, but less common, data problems that may be encountered.

THE RRS SOFTWARE DOES NOT AUTOMATICALLY EDIT OR DELETE ALL ERRONEOUS DATA. It only alerts you to questionable or potentially erroneous data. If you do not edit the sounding data as required, erroneous data will appear in the coded messages and be transmitted to data users. Most observer quality control of the data should be done prior to data or message transmission.

9.2 Data Editing Commands

The RRS commands that can be used to view and edit data during a flight are fully described in Chapters 3 and 4 and may be executed any time during the observation.

9.3 RRS Data Checks

The RRS software will automatically flag potentially erroneous meteorological and position data in the following ways:

a. Status Messages - Viewed by clicking the Messages option and selecting the Status option.

b. Check Messages - Viewed by clicking the Messages option and selecting the Check option.

c. Color coding within the Raw and Processed Data.

9.3.1 Status Messages

Flight Status Messages displayed in the Status Message Display indicate numerous events or data problems that may occur during a flight.

Status Messages

No.	Message	Type
1	No appropriate flight found for comparison	P
2	Comparison flight is more than 12 hours before current flight.	P
3	Observer has backed out of baseline and reentered preflight information entry.	P
4	Radiosonde has been baselined successfully.	P
5	SPS has been initialized successfully.	P
6	TRS initialization in progress.	P
7	TRS busy with motor warm-up operations.	P
8	TRS completed initialization successfully.	P
9	TRS completed initialization unsuccessfully.	P
10	TRS is ready.	P
11	***Balloon burst detected at mm.t minutes***	I
12	***Descending balloon detected at mm.t minutes.***	I
13	***Flight terminated: <reason>***	I
14	***Floating balloon detected at mm.t minutes***	I
15	RADAT message has been generated.	I
16	Successful observation.	I
17	Successful release.	I
18	***Unsuccessful observation.***	I
19	***Unsuccessful release.***	I
20	Antenna locked on at %s UTC.	I
21	Balloon release detected at %s UTC.	I
22	Balloon released <punctuality> outside of synoptic window. Observation re-categorized as a %s special Observation.	I
23	Flight was initiated: Date %s; Ascension %i; Release %i.	I
24	Balloon released <punctuality> within a synoptic window. Observation re-categorized as a %s synoptic Observation.	I

25	***Message transmission parameter error.***	I
26	Part <x> transmission SUCCESSFUL.	I
27	***Part <x> transmission UNSUCCESSFUL.***	I
28	Release time changed to <hh:mm:ss.fff>.	I
29	Surface Observation data was successfully modified.	I
30	Surface observation entries have been rechecked after balloon release.	I
31	Flight Levels termination is set to <elapsed time (minutes)> minutes	I
32	***Flight has no termination level.***	I
33	***Reascending balloon detected -- mm.t minutes lost.***	I
34	Coded Messages were generated	I
35	Status Code 0 - UPS has been turned off.	I
36	Status Code 2 - UPS is in SmartTrim mode.	I
37	Status Code 4 - UPS is in SmartBoost mode.	I
38	Status Code 8 - UPS is now running on on-line power supply	I
39	Status Code 10 - UPS is in SmartTrim mode - UPS is now running on on-line power supply	I
40	Status Code 16 - UPS in now running on battery.	I
41	Event marker received from SPS	I
42	Termination reason changed to <reason>	I
43	External Backup Device has been removed. Switching to alternate backup folder (C:\RWSBackup).	I
44	External Backup Device has been restored. RWS will backup files to external folder (%s).	I
45	User added message	I
46	TRS is reporting a critical equipment failure.	I
47	Status Code 16 - UPS is now running on battery	I

NOTES: 1. Bolded italics areas considered “Critical” messages.
2. I - Inflight Message P - Pre-flight Message
% Is a place holder

Data problems may be investigated by using the Plots and Tables options at the top of the RRS screen display. From the Plots option the Meteorological and Position data may be viewed. From the Tables option, the Processed and Position data may be viewed. Exhibit 9-1 shows status messages indicating that the data at release may be invalid or need checking.

NOTE: The "Descending Balloon Detected" message at 0.0 minutes.

The Status command allows the operator to view a listing of all of the Flight Status Messages of the flight. This command allows you to monitor and review the status of the flight for significant event occurrence.

Status Messages Display

Add Message

UTC Time	Flight Status Message	Comment
18:02:03.96	Flight was initiated: Date 12-01-2003; Ascension 5; Release 1.	
18:02:23.26	UPS has been turned off.	
18:02:43.92	UPS is now running on battery.	
18:02:49.26	UPS is now running on on-line power supply.	
18:12:43.88	SPS has been initialized successfully.	
18:14:49.96	Radiosonde has been baselined successfully.	
18:21:16.62	No appropriate flight found for comparison.	
18:21:16.62	Balloon release detected at 18:21:16.609 UTC.	
18:22:53.04	Descending balloon detected at 0.0 minutes.	
18:27:50.98	Successful release.	
18:30:22.38	Descending balloon detected at 0.0 minutes.	
18:30:24.88	Coded Messages were generated.	
18:43:24.59	Event marker received from SPS	test in progress
18:49:24.21	Coded Messages were generated.	
18:49:24.24	The RADAT message has been generated.	
19:07:05.06	Descending balloon detected at 44.2 minutes.	
19:08:17.03	Reascending balloon detected -- 0.5 minutes lost.	
19:13:52.04	Descending balloon detected at 51.0 minutes.	
19:15:42.07	Reascending balloon detected -- 0.5 minutes lost.	
19:29:03.60	Coded Messages were generated.	
20:00:28.10	Flight terminated: Excessive missing temperature data.	
20:00:28.73	Flight Levels termination is set to 99.1 minutes	
20:00:30.29	Coded Messages were generated.	
20:00:30.74	Successful observation.	
20:01:26.54	UPS has been turned off.	
16:00:29.37	Coded Messages were generated.	

Exhibit 9-1 Status Message Display

9.3.2 Check Messages

The Code, Generate Levels, and Apply User Edits commands each generate Check Messages. Messages displayed may indicate problems with the data that require your attention. Typically, these messages point out data that are inconsistent with the rest of the sounding data or with data from the previous flight. Review Check Messages for suspicious or missing data.

Check Messages

No.	Message	Type
1	No previous flight data available for comparison.	P
2	Data missing near possible Tropopause. Check Tropopause.	I
3	There was a height change of <height change (meters)> meters from previous flight at time <elapsed time (minutes)>.	I
4	There was a temperature change of <temperature change (degrees Celsius)> degrees from previous flight at time <elapsed time (minutes)>.	I
5	Missing mandatory pressure level at <pressure (hPa)> millibars	I
6	***Multiple levels with same pressure*** **at times <elapsed time (minutes)> and <elapsed time (minutes)>**	I
7	No tropopause found at 500 mb or above. Tropopause found at <pressure (hPa)> will be used.	I
8	There is a temperature lapse rate of <value> degrees per kilometer between the levels at <elapsed time (minutes)> and <elapsed time (minutes)> minutes.	I
9	There is no level within 20mb of the surface.	I
10	Wind direction change of <angle (degrees)> degrees between minutes <elapsed time (minutes)> and <elapsed time (minutes)>.	I
11	Wind speed change of <wind speed change (knots)> knots between minutes <elapsed time (minutes)> and <elapsed time (minutes)>.	I
12	***Wind speed exceeds 180 knots from minute <elapsed time (minutes)> to minute <elapsed time (minutes)>.***	I
13	Superadiabatic Lapse Rate of <value> Deg/Km detected from <elapsed time (minutes)> to <elapsed time (minutes)> minutes	I

NOTES:
1. Bolded italics areas considered “Critical” messages.
2. I - Inflight Message P - Pre-flight Message

% Is a place holder

Examine each message and determine if data editing is required. Exhibit 9-2 shows Check Messages generated by the Code command for a flight with questionable heights, temperature lapse rates, position data, and winds.

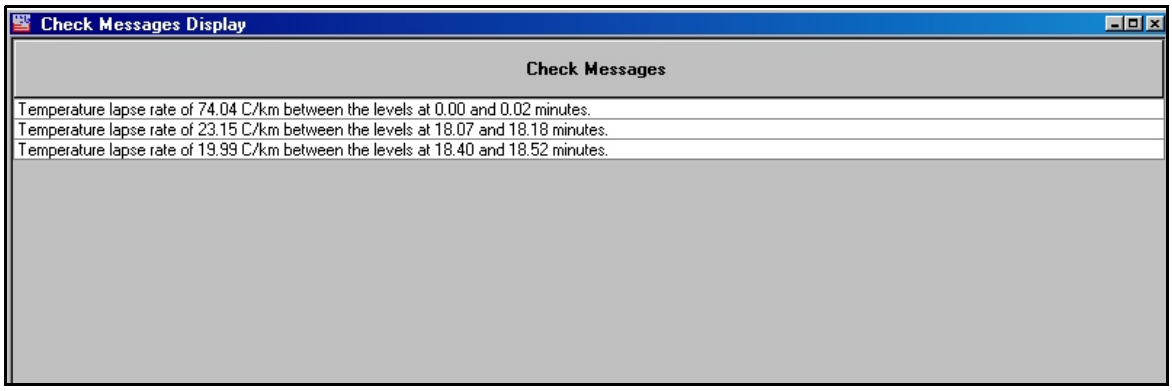


Exhibit 9-2 Check Messages Display

9.4 Printing Data and Plots

While a flight is in progress, you can print data at any time. Place the cursor in the window you wish to print and click the right mouse button and select the Print option. When printing tabular data be sure to print only data needed. Printing the raw or processed data may take many pages to copy and be quite time consuming, use the elapsed time option. Before printing, check to see that the printer power light is on.

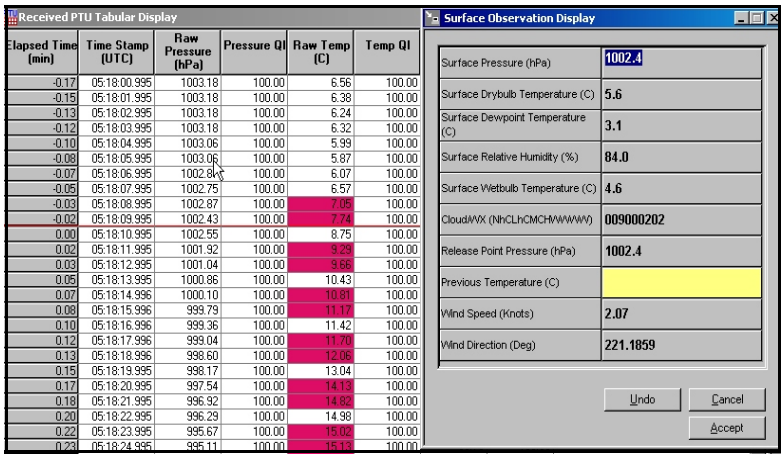
9.5 Checks During the First Minutes of the Flight

If the balloon release is successful, it is important that first, the Surface Observation being validated. Then the Release Point should be verified, and then data above surface such as pressure, temperature, relative humidity, and wind data be checked for erroneous data within the first 5-10 minutes.

9.5.1 Verifying the Time of Release

RRS software will determine the time of release from the decrease in pressure. In some cases, the initial time of release may be off. The operator must go into the Received PTU and compare the pressure at release and shortly after the release to verify when the pressure began to steadily decrease. (See Exhibit 9-3)

NOTE: The proper Release Point pressure is determined by writing down the Surface Pressure at Release from the PDB from the Surface Observation Display. Then, either adding or subtracting the height correction if any from the Baseline Point to the Release Point. If the Release Point is lower a correction will be added to value from the PDB.



Received PTU Tabular Display

Elapsed Time (min)	Time Stamp (UTC)	Raw Pressure (hPa)	Pressure QI	Raw Temp (C)	Temp QI
-0.17	05:18:00.995	1003.18	100.00	6.56	100.00
-0.15	05:18:01.995	1003.18	100.00	6.38	100.00
-0.13	05:18:02.995	1003.18	100.00	6.24	100.00
-0.12	05:18:03.995	1003.18	100.00	6.32	100.00
-0.10	05:18:04.995	1003.06	100.00	5.99	100.00
-0.08	05:18:05.995	1003.06	100.00	5.87	100.00
-0.07	05:18:06.995	1002.81	100.00	6.07	100.00
-0.05	05:18:07.995	1002.75	100.00	6.57	100.00
-0.03	05:18:08.995	1002.87	100.00	7.05	100.00
-0.02	05:18:09.995	1002.43	100.00	7.74	100.00
0.00	05:18:10.995	1002.55	100.00	8.75	100.00
0.02	05:18:11.995	1001.92	100.00	9.29	100.00
0.03	05:18:12.995	1001.04	100.00	9.66	100.00
0.05	05:18:13.995	1000.86	100.00	10.43	100.00
0.07	05:18:14.996	1000.10	100.00	10.81	100.00
0.08	05:18:15.996	999.79	100.00	11.17	100.00
0.10	05:18:16.996	999.36	100.00	11.42	100.00
0.12	05:18:17.996	999.04	100.00	11.70	100.00
0.13	05:18:18.996	998.60	100.00	12.06	100.00
0.15	05:18:19.995	998.17	100.00	13.04	100.00
0.17	05:18:20.995	997.54	100.00	14.13	100.00
0.18	05:18:21.995	996.92	100.00	14.82	100.00
0.20	05:18:22.995	996.29	100.00	14.98	100.00
0.22	05:18:23.995	995.67	100.00	15.02	100.00
0.23	05:18:24.995	995.11	100.00	15.13	100.00

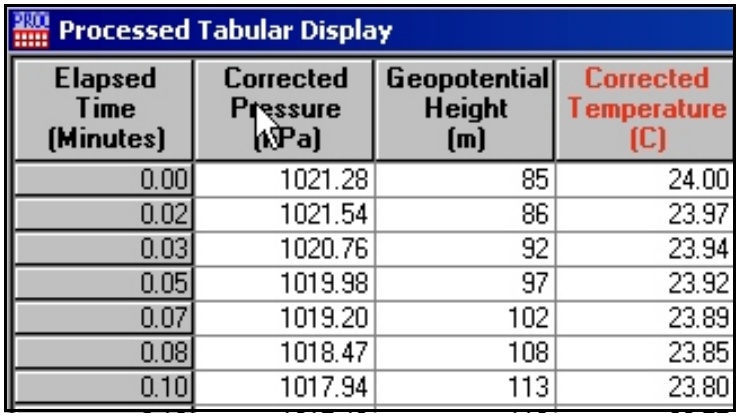
Surface Observation Display

Surface Pressure (hPa)	1002.4
Surface Drybulb Temperature (C)	5.6
Surface Dewpoint Temperature (C)	3.1
Surface Relative Humidity (%)	84.0
Surface Wetbulb Temperature (C)	4.6
CloudMVX (NhCLhCMCHWWWW)	009000202
Release Point Pressure (hPa)	1002.4
Previous Temperature (C)	
Wind Speed (Knots)	2.07
Wind Direction (Deg)	221.1859

Undo Cancel Accept

Exhibit 9-3 Received PTU and Surface Observation Screens

The observer may also use the Processed Data Set to verify the Time of Release. Position the cursor inside the Processed Tabular Data window and right click. The observer should key in on the change in the Geopotential Height (m) column. The time of release is indicated when the height increases from the known station height. (See Exhibit 9-4)



Processed Tabular Display

Elapsed Time (Minutes)	Corrected Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)
0.00	1021.28	85	24.00
0.02	1021.54	86	23.97
0.03	1020.76	92	23.94
0.05	1019.98	97	23.92
0.07	1019.20	102	23.89
0.08	1018.47	108	23.85
0.10	1017.94	113	23.80

Exhibit 9-4 Validating Height Change

NOTE: The level selected at 0.02 minutes has a higher pressure than the surface pressure. This indicates either a need to adjust the release time or possible bad data.

9.5.2 Checking the Pressure Profile

It is very important to plot the pressure profile of the flight to ensure that the pressure sensor is working correctly and is providing data that it is a true representation of the atmosphere. Follow these steps to check the pressure profile:

1. Review the pressure profile for the first ten minutes of the flight. It should be a smooth curve with a slightly concave shape. Exhibit 9-5 shows an example of this profile.

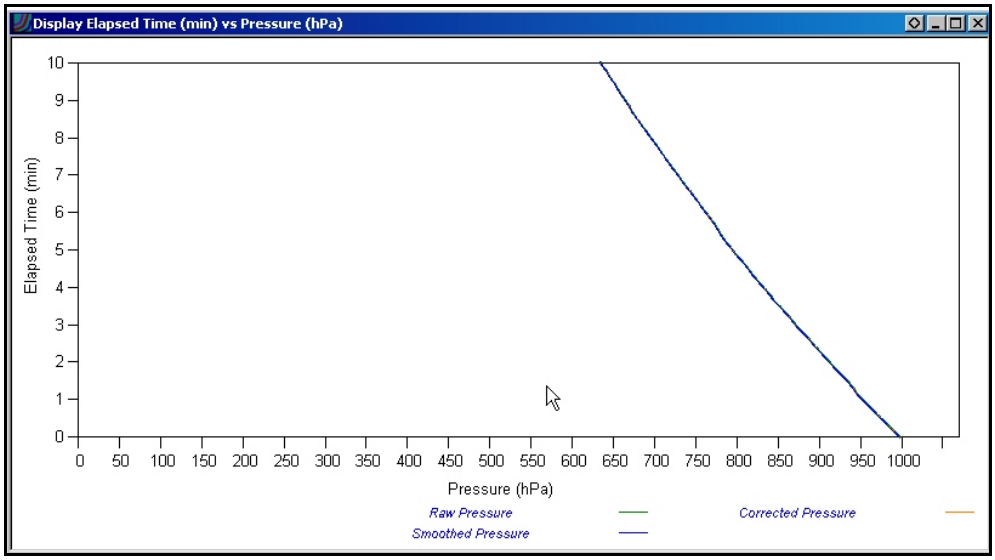


Exhibit 9-5 Pressure Plot for Initial 10 Minutes of the Flight

2. In some special situations the profile may look erratic with data spikes. RRS may also prompt you to verify that you entered the correct station pressure. Refer to Chapter 13 for further descriptions of unusual pressure profiles.

9.5.3 Checking for Super-adiabatic Lapse Rates Near the Surface

Sometimes, a super-adiabatic lapse rate occurs between the surface temperature and the first few data points reported by the radiosonde. The magnitude of the super-adiabatic lapse rate is normally reported by a Check Message for a temperature lapse rate or abnormal cooling which is greater than 34° C per kilometer within a kilometer of the surface and 15° C per kilometer thereafter.

Super-adiabatic lapse rates occur frequently within 20 hPa of the surface (super-adiabats occurring higher in the flight are discussed in Chapter 13, Section 13.2.1). Many low-level super-adiabatic lapse rates are legitimate meteorological events that result from solar heating of the ground. However, if a layer exists with a super-adiabatic lapse rate exceeding 34^{O}C per kilometer, it may be due to a radiosonde problem or an error in the surface temperature observation (i.e., entered incorrectly, the surface temperature equipment is out of calibration, or the observation was taken too far from the release point).

On the RRS Temperature Plot, a near surface super-adiabatic lapse rate appears as a line that has a greater deviation to the left or colder temperatures than the rest of the sounding. Exhibit 9-6 shows an example of a super-adiabatic lapse rate near the surface.

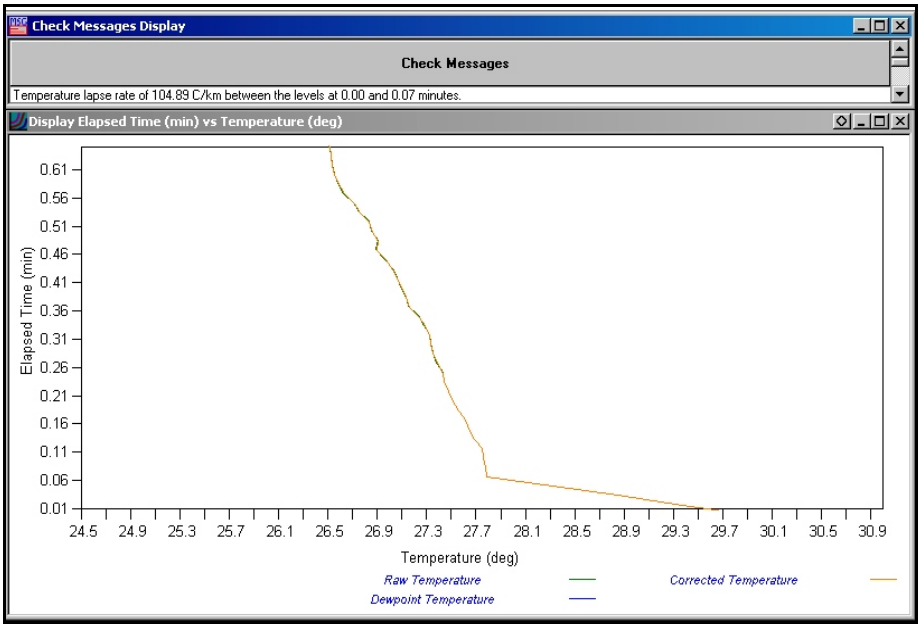


Exhibit 9-6 Superadiabatic Lapse Rate Near Surface

If the RRS software detects a super-adiabatic lapse rate near the surface, follow these steps:

1. At the top of RWS screen display, click the "Tools" option. Click on "Change Surface Observation" option. Verify that the surface temperature is correct and if so, proceed to Step 2. Otherwise, correct the surface temperature while the Surface Observation is displayed. Select the Code command by clicking on the "Messages" option at the top of the RWS screen display. Verify that the superadiabatic lapse rate in the Check Message has changed or eliminated. If it does, no further data editing is required. If it does not eliminate the superadiabatic lapse rate message, proceed to step 2.

2 If the super-adiabatic layer still has a lapse rate of more than 34^{O} C per kilometer, click the Plots option at the top of the RWS screen display and click the Temperature option to display the temperature profile. The start time for the plot should be 0.0 and the end time should be large enough to cover the period of the callup. Examine the plot to determine the vertical extent of the super-adiabatic layer. Click on the Tables option at the top of the RWS screen display and select the Processed option to display the processed data. Mark the Corrected Temperature field, click and drag the left mouse button on the data points within the superadiabatic lapse rate callup. After selecting the data to edit or delete, click the right mouse button and click on Apply User Edits. Then, click on the Messages option at the top of the RWS screen display and click on Code option in the pull-down window. Recheck the temperatures just above the surface by either looking at the temperature plot or check messages. Mark any temperature data in the super-adiabatic layer that appears unrepresentative.

3. If after running Code, RRS still indicates a super-adiabatic lapse rate near the surface, but the lapse rate is less than 34^{O}C per kilometer, accept the lapse rate as valid. If the super-adiabatic lapse rate is still greater than 34^{O}C per kilometer, you must check the validity of the temperature data. Let the sounding continue, but compare the temperature and mandatory pressure height data with the previous sounding. If there are significant temperature changes and/or height changes (RRS will alert you of significant height changes with Check messages) from the previous sounding that cannot be attributed to changing atmospheric conditions, terminate the sounding.

9.5.4 Verifying Wind Accuracy

Under the Plot options select "Winds" to plot the winds speed and direction. Looking at data from release to 5 minutes or less is typically a large enough time to determine if the winds at release needs adjusting. If the winds look bad, go to the Table Option, go into the Processed Option and mark the Wind U and V Components columns to the right of the Wind Direction and Wind Speed columns considered inaccurate. Right click and select Apply User Edits. To verify if the data editing was sufficient, select the CODE option. If data editing was sufficient, the first wind observation aloft should not deviate too much from what was observed at the surface or if much change has occurred the change should be smooth. Chapter 13, Section 13.4, provides additional information on detecting erroneous position data and winds aloft.

As an example, Exhibit 9-7 shows a "Wind" plot with direction and speed prior to editing of any "U and V" data. Exhibit 9-8 illustrates the plot after editing of "U and V" data for the first 2.0 minutes.

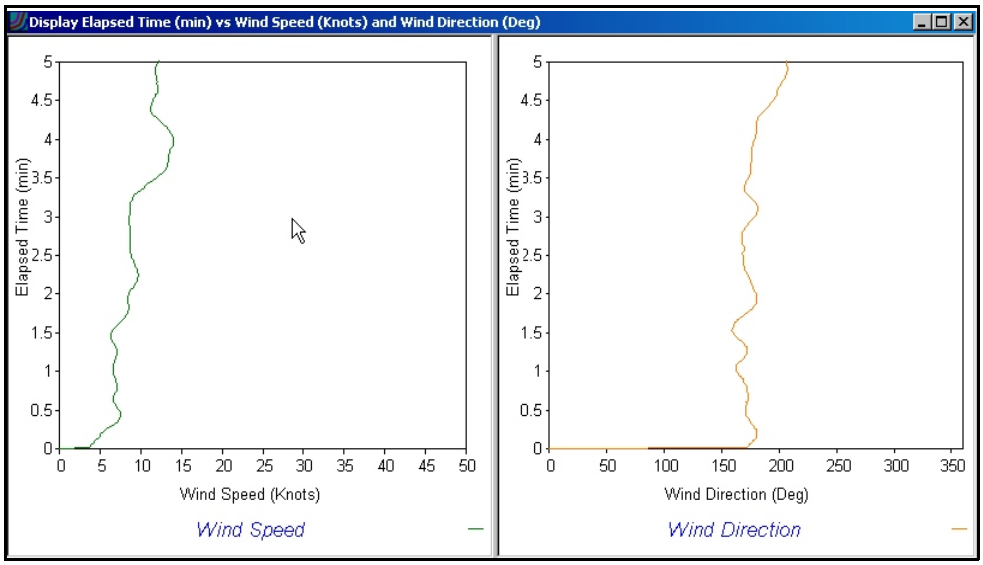


Exhibit 9-7 Wind Plot Prior to Editing

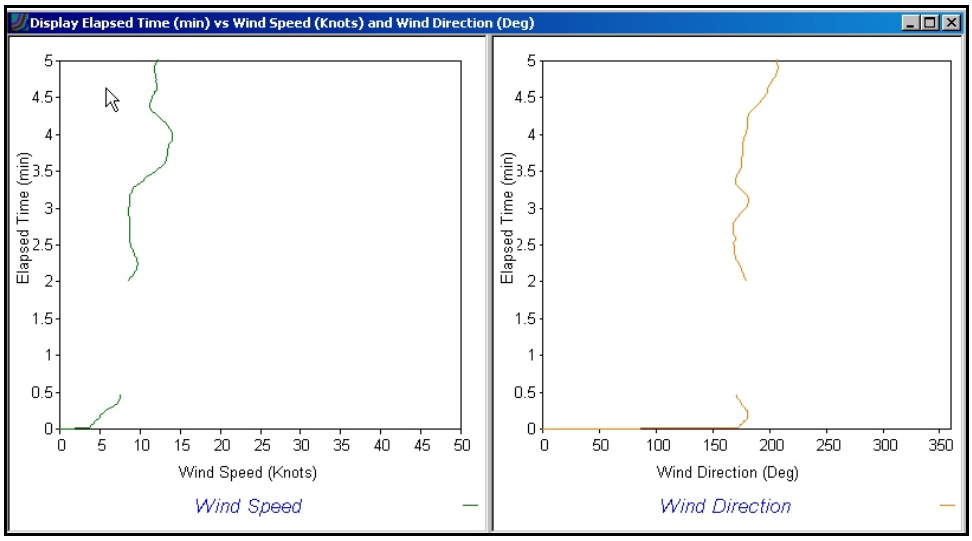


Exhibit 9-8 Wind Plot After Editing

9.5.5 Signal Loss

The radiosonde signal may be lost off the surface due to a variety of reasons. If the signal is lost continuously for a minute, an audible alarm will sound. Check to see that the antenna is locked onto the radiosonde by verifying the frequency and signal strength. The antenna may not be pointed correctly and may need to be repositioned. If the radiosonde and GPS signal returns, verify the Raw Position Data has "U and V" data. If the signal loss is too long, the amount of missing data may result in flight termination. Chapter 11 describes how to process an aborted flight.

9.6 Typical Meteorological Features Observed Aloft

Most observations will contain one or more of the following features which you should be proficient in identifying:

a. Freezing levels
b. Missing data
c. Jet Stream winds
c. Tropopause
d. Flight Termination (Discussed in Chapter 11) .

9.6.1 Identifying Freezing Levels

Freezing levels are points where the temperature crosses the 0°C isotherm. Exhibit 9-9 illustrates a flight with freezing level plotted on the temperature and RH profile between 15 and 16 minutes in the flight. The RRS software automatically records the freezing level(s) and reports it in the RADAT message (See Section 10.3.2.3 for more information on the RADAT message).

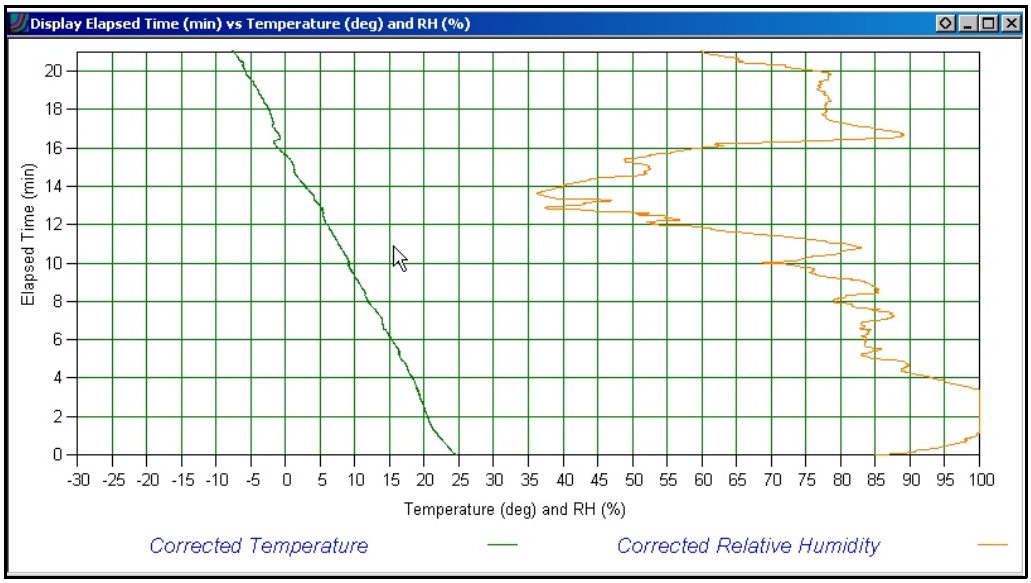
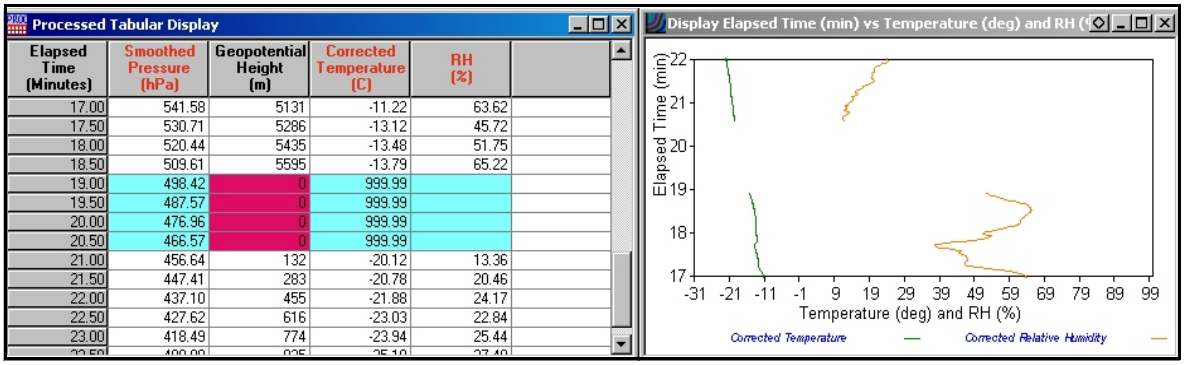


Exhibit 9-9 Crossing of the Freezing Level

9.6.2 Rejected or Missing Data

Meteorological data received with a poor signal quality may be considered invalid by RRS software or the SPS and automatically set to missing. The observer may mark data in the columns and set it missing with a "Red" data type within the Processed Tabular Display. ***Marking of data can only be performed when the Processed Data Set (PDS) is in the 1-second interval.*** Exhibit 9-10 shows layers of missing temperatures and relative humidity which appear as blank spaces in the profiles. The WMO Levels may have Begin Missing Data (BMD) and End Missing Data (EMD) under the Reason Column indicating missing data.

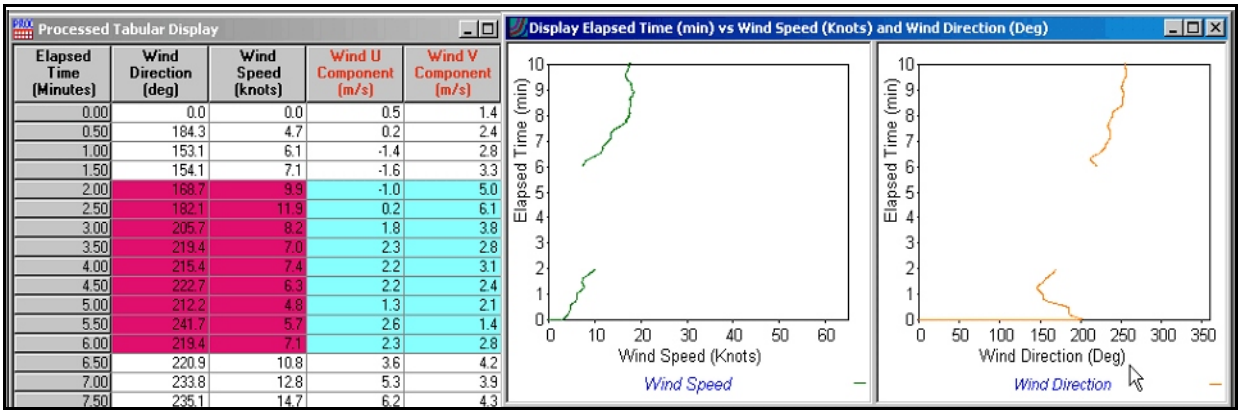
NOTE: Missing temperature and/or RH data must be 1 minute or more in duration for the data to be set to missing and not interpolated. The flight will terminate if missing Temperature data reaches 3 consecutive minutes. ***Operator edits are not included only data deemed missing by the software.***



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)
17.00	541.58	5131	-11.22	63.62
17.50	530.71	5286	-13.12	45.72
18.00	520.44	5435	-13.48	51.75
18.50	509.61	5595	-13.79	65.22
19.00	498.42	0	999.99	
19.50	487.57	0	999.99	
20.00	476.96	0	999.99	
20.50	466.57	0	999.99	
21.00	456.64	132	-20.12	13.36
21.50	447.41	283	-20.78	20.46
22.00	437.10	455	-21.88	24.17
22.50	427.62	616	-23.03	22.84
23.00	418.49	774	-23.94	25.44

Exhibit 9-10 Edited Temp/RH Tabular and Plot Display

Wind data will be set to missing if GPS is not acquired, (minimum 4 matches), lost and also if deleted by the observer. Wind Direction and Wind Speed is interpolated if less than a minute of the Wind U/V Components is lost. Exhibit 9-11 shows an example of missing winds from 2.0 to 6.0 minutes of the flight.



Elapsed Time (Minutes)	Wind Direction (deg)	Wind Speed (knots)	Wind U Component (m/s)	Wind V Component (m/s)
0.00	0.0	0.0	0.5	1.4
0.50	184.3	4.7	0.2	2.4
1.00	153.1	6.1	-1.4	2.8
1.50	154.1	7.1	-1.6	3.3
2.00	168.7	9.9	-1.0	5.0
2.50	182.1	11.9	0.2	6.1
3.00	205.7	8.2	1.8	3.8
3.50	219.4	7.0	2.3	2.8
4.00	215.4	7.4	2.2	3.1
4.50	222.7	6.3	2.2	2.4
5.00	212.2	4.8	1.3	2.1
5.50	241.7	5.7	2.6	1.4
6.00	219.4	7.1	2.3	2.8
6.50	220.9	10.8	3.6	4.2
7.00	233.8	12.8	5.3	3.9
7.50	235.1	14.7	6.2	4.3

Exhibit 9-11 Edited Wind U/V Components and Plot Display

NOTE: Rejected or missing data will not be shown in the WMO Coded Messages unless the thickness of the missing or rejected data is at least 20 hPa. Wind data will only be coded as missing in the WMO Coded Message if the layer is at least 1500 meters thick.

NOTE: If Temperature Data is either Missing or Rejected for a consecutive minute an alarm will sound and a Popup Message will appear. This will occur again if two consecutive minutes are missing or rejected. After 3 minutes the flight will terminate.
.

9.6.3 Jet Stream Winds

Jet streams are narrow bands of high speed winds that meander around the Earth at altitudes ranging from 10 to 15 km. These high speed winds are generally 2 to 3 km thick and can be hundreds of km wide. (See Exhibit 9-12) Maximum wind speeds within jet streams can exceed 200 knots and are strongest during the winter and spring months. By using the Plot Option and selecting Winds, you can check if jet stream winds were observed. The RRS software records the highest winds and will generate a check message if winds exceed 180 knots.

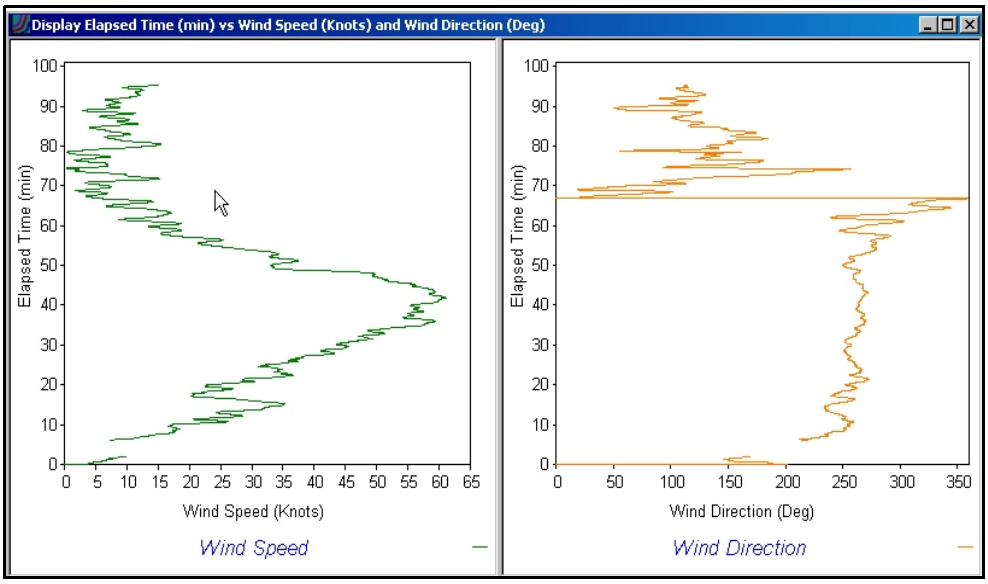


Exhibit 9-12 Max Wind Plot

9.6.4 Identifying the Tropopause

The tropopause is the level in the atmosphere where the rate of temperature decrease with height slows or stops. The average height of the tropopause is about 10 km. Its height varies with latitude and time of year. Above the tropopause is the stratosphere where temperature remains nearly constant or begins increasing with height. The tropopause is a feature of almost all upper air soundings, although sometimes it is not clearly defined. Exhibit 9-13 shows the tropopause near minute 51. The software automatically detects and records the tropopause.

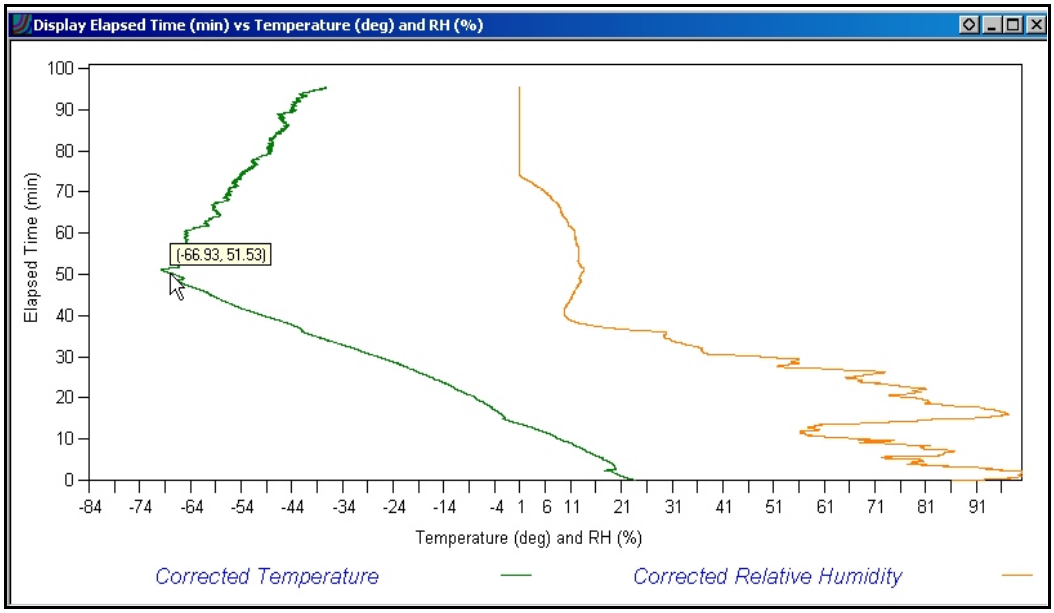


Exhibit 9-13 Tropopause at Approximately 51 Minutes

9.6.5 Balloon Burst

Balloon burst is typically detected by the software when the ascent rate changes from ascending to descending. Verification that the software picked the correct point to terminate the flight is done by observing the last minute or two of the Processed Data. (See Exhibit 9-14) Again, looking at the ascent rate or maximum height should be the key indicators of where burst or termination occurred. It must be remembered that the observer needs to consider if the balloon was ascending at a reasonable rate and the PTU data looks accurate. If all these factors are reasonable, then the maximum geopotential height (GPH) of the sounding should be considered the point of burst.

76.03	06:34:13	48.83	48.81	20618	-55.17	243.30	14.80	-69.96
76.05	06:34:14	48.79	48.77	20624	-55.16	243.44	14.80	-69.95
76.07	06:34:15	48.73	48.73	20628	-55.17	243.53	14.80	-69.96
76.08	06:34:16	48.67	48.69	20634	-55.19	243.60	14.80	-69.98
76.10	06:34:17	48.62	48.65	20639	-55.22	243.65	14.80	-70.01
76.12	06:34:18	48.61	48.61	20645	-55.23	243.76	14.80	-70.01
76.13	06:34:19	48.56	48.57	20650	-55.23	243.88	14.80	-70.01
76.15	06:34:20	48.55	48.52	20655	-55.24	243.98	14.80	-70.02
76.17	06:34:21	48.49	48.48	20661	-55.26	244.06	14.80	-70.04

```
TTDD  5205/ 69991 11917 63363 22869 61363 33838 62563 44820
60563 55768 59764 66748 57364 77687 60963 88620 58564 99571
60964 11524 58964 22512 55765 33485 55365 51515 10159=
```

Exhibit 9-14 Max Height Indicated in Processed Data and in TTDD Message

9.7 Automatic Command Execution

The RRS software automatically issues certain commands at key points during a flight. These commands are discussed in the following sections.

9.7.1 Automatic Command Execution at 400 hPa

At 400 hPa, the RADAT is generated and displayed automatically. An audible alarm notifies the operator. A message appears in the Status Message Display to indicate the RADAT message has been generated. Transmitting the RADAT requires moving the cursor to the lefthand box in the WMO Coded and Radat Message window and placing the cursor in the small box to the left of the "FZL" (RADAT) and clicking it until a "Red" checkmark appears, then clicking on the "Transmit" button. The temperature profile can be plotted and the processed data examined to ensure the RADAT has been coded correctly. Clicking on Tables, and selecting the WMO Levels option or under Plots selecting the Temperature-RH plot can also be used to verify the freezing level data.

At 400 hPa the flight is deemed successful unless too much data is missing. A message appears in the Status Message Display indicating whether or not the flight was successful. If the flight is unsuccessful, follow the instructions in Chapter 11 for processing the flight.

9.7.2 Automatic Command Execution at 70 hPa

When a flight reaches 70 hPa (mb), the CODE command is issued automatically and an alarm sounds. The Message windows (see Chapter 10) are then displayed automatically. The Check, Status, and Coded Message windows appear. Part A of the WMO Coded and RADAT Message window is displayed. (Part B or C/D may appear if Part A has been displayed previously.) Review the mandatory and significant levels (using the WMO Levels Table, Temp and RH Plot, and the Check Messages) for correctness. If editing is required, go into the Tables option and select Processed Data and review the area needing attention. After marking the data, right click the mouse inside the window, select Apply User Edits and run Code to verify Check messages. In addition, look again at plotted data to ensure edits have eliminated the bad or questionable data.

If the messages are correct, transmit them to the host computer as described in Chapter 10. Also, it is advisable to check the validity of the calculated parameters by clicking on the View option at the top of the RRS screen display and clicking the Flight Summary option.

Occasionally it may be necessary to correct or edit a coded message prior to transmission. Usually this entails adding a code group to complete the message. Use the technique explained in Chapter 4 to add or delete code groups.

9.7.3 Automatic Command Execution at Termination

When a flight is terminated, either manually by clicking on the Flight option at the top of the RWS display and selecting the Terminate option or automatically by the RRS software, the Code command is automatically run. The process is identical to that described in Section 9.7.2.

10. RRS Observation - Transmitting Messages

10.1 Introduction

This chapter discusses the procedure for transmitting WMO Coded Messages to host computers. The following section describes general procedures for transmission.

10.2 General Procedures

Messages may be automatically or manually generated within the RRS software. No Data, RADAT, Check, Status, and WMO Levels messages are generated. These messages are either transmitted or used to verify data accuracy and RRS system status. The focus of this chapter is on the transmitted messages. These messages are the RADAT, No Data message, and WMO Coded messages.

NOTE: It is important to remember that messages may be transmitted up to 6 hours after flight termination in REWORK.

10.3 Coded Messages

Coded messages may be manually generated anytime during the flight. The RRS software will code WMO coded messages whenever the Code Option is selected from the Messages option at the top of the RWS screen display. During an observation, the RRS software issues the CODE command and alarms automatically when the flight reaches 400 hPa, 70 hPa, and at termination.

The MESSAGE window allows the editing and transmitting of coded messages anytime during a flight and in Rework up to 6 hours after flight termination. A message may be transmitted by clicking on the desired message in the upper left box. A **"Red Check"** indicates the message to be transmitted**.** The **"Transmit"** button, when clicked, will transmit the coded message.

The RRS software has been designed to automatically include required 101 groups to cover most situations. Because of this, the program does not present a prompt asking for 101 groups. Even with this automation, the operator should take the responsibility of ensuring that special situations are handled properly. If an additional data group is needed and the program fails to code it, place the cursor at the desired location in the Message Content window and add the 5 digit group. Move the cursor outside the window when finished editing. Do not remove 101 groups that were automatically encoded. These were included in the program based on detailed studies and interpretation of present coding procedures.

The RRS software does not compute fallout winds. If stations have a need for fallout winds, it is suggested that they go to the Atmospheric Resources Laboratory (ARL) website for dispersion models. (http://www.arl.noaa.gov/hysplitps-bin/concsrc.pl?metdata=Eta+40+km) Enter in the WMO ID or Latitude and Longitude along with other pertinent data to have a dispersion model plotted.

10.3.1 Using the Manual Code Option

Unless the RRS software has automatically issued the CODE command, click on the Code option to manually code a WMO message. From the WMO Message Display select the message you wish to view. If the MAN option is selected, the screen showing the TTAA coded message appears. (See Exhibit 10-1)

NOTE: The group following the 10164 is the stability index and the two groups following the 10194 group are the mean level winds from surface to 5,000 feet and from 5,000 feet to 10,000 feet. Additional groups may be manually added by moving the cursor to the desired location and typing in the 5 digit group.

```
69003 TTAA  70001 69003 99021 24056 01002 00258 22458 12503
92930 16439 12007 85645 12458 10004 70244 05699 01014 50591
11577 05523 40758 24778 06029 30960 41387 05525 25081 51383
06525 20224 57782 17003 15404 59781 26501 10658 61581 30513
88179 60381 05024 77999 51515 10164 00007 10194 11005 01008=
```

Exhibit 10-1 Mandatory Levels to 100 hPa

Clicking on the SIG option will display the TTBB and PPBB messages. (See Exhibit 10-2)

```
69003 TTBB  70000 69003 00021 24056 11018 23861 22974 20050
33918 15631 44860 13058 55859 13058 66838 11457 77831 11057
88823 10444 99799 08428 11797 08225 22791 08656 33777 08059
44776 07859 55753 05659 66734 03656 77733 03456 88728 03460
99722 04471 11715 05071 22712 05489 33711 05695 44709 05699
55701 05699 66674 04099 77659 02676 88653 02276 99643 02499
11640 02699 22634 02099 33605 00576 44598 01176 55567 04774
31313 58708 80003 41414 00900 51515 10159=

PPBB  70000 69003 90012 01002 12003 10006 90346 12007 11007
08005 90789 00507 35011 36012 91246 35517 05518 04021=
```

Exhibit 10-2 Significant Levels and Winds to 100 hPa

The group immediately after the 31313 group tells the user if a solar correction is used, the radiosonde type and the ground equipment used. The second group following the 31313 group always begins with an eight. This group provides actual time of release in UTC.

31313 $s_r r_a r_a s_a s_a$ 8GGgg - (Example : 31313 58708 80003)

s_r - Solar and infrared radiation correction
$r_a r_a$ - Radiosonde/sounding system used
$s_a s_a$ - Tracking technique/status of system used

8 - Indicator for time
GGgg - Time of observation in hours and minutes UTC. The actual time of radiosonde release.

58708 -
0 - No solar correction
5 - Data corrected for solar radiation
87 - Type of radiosonde
87 - Describes a SIP GPS radiosonde
08 - Type of Tracking Used
08 - Describes a GPS tracking system

80003 -
8 - Is a designator to indicate that the release time follows
0003 - Is the actual time of release in UTC in hours and minutes.

The group immediately after the 41414 is the cloud code group. Appendix B covers the coding and decoding of the cloud group and weather group that are entered during pre-flight.

41414 $N_hC_LhC_MC_H$ - (Example 41414 81571)

N_h - Cloud amount in eights of the sky of low or middle clouds.

NOTE: Only the amount of the low clouds if present. If no low clouds, then the amount of middle clouds. Never include high clouds.

C_L - Type of low cloud.

h - Height of lowest cloud layer

C_M - Type of middle cloud

C_H - Type of high cloud

The group or groups immediately after the 51515 group tells the user additional information about the flight or reason for termination. 101 groups are groups strictly for U.S. stations. The 101 code breakdown is shown on pages 10-13 and 10-14.

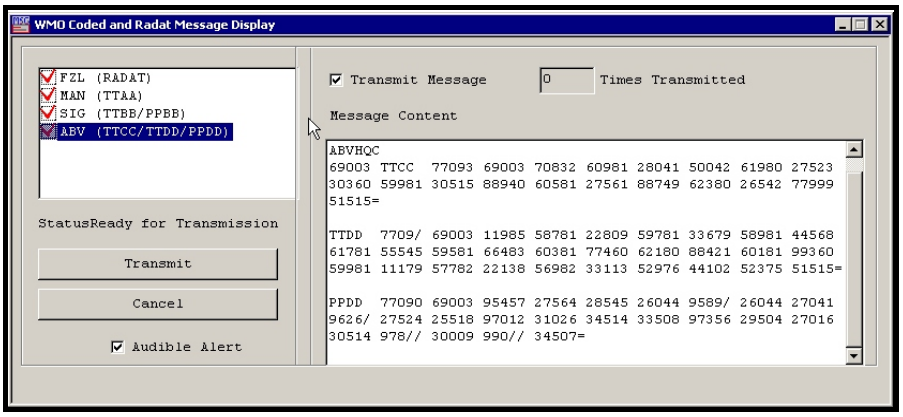


Exhibit 10-3 MAN and SIG Messages Above 100 hPa

Selecting the ABV option will display the TTCC, TTDD, and PPDD messages. (See Exhibit 10-3) To insert additional groups place the cursor at the point you wish to enter the group and type the 5 digit group or groups. To delete a group place the cursor before the group and press the [Del] key. The group to the right of the cursor will be highlighted prior to deletion. The Transmit option when invoked displays slightly different headers if your site is in WMO Region 4 or 5 or if your communication equipment is not connected to AWIPS.

Caution should be exercised when adding groups. Seldom if ever should an operator need to add 5 digit groups other than the 101 groups. Adding a "10148" group to a "No Data" message when an additional release is not authorized is an exception.

NOTE: All Conus and Alaska sites are Region 4 locations. Region 5 consists of Pacific Region sites. Region 5 will code the Mean Low Level Wind and Stability Index groups like Region 4 sites.

10.3.2 The RADAT Message

The RADAT message indicates the height of the freezing level(s) in hundreds of feet based on pressure altitude along with the relative humidity at the various crossings. This data is important to meteorologist and aviation interests. The RADAT message is produced automatically at 400 hPa or may be manually activated by selecting "Code" under the Message option during the flight. After the RADAT message is coded, the software allows the operator to transmit it directly from the RRS workstation.

10.3.2.1 Manually Coding the RADAT Message

This may be done anytime during the flight by going to the top of the RWS screen display and clicking on the Messages option. The pull-down options are displayed, click on Code. (See Exhibit 10-4.) Ensure the flight has gone beyond the freezing level and has no chance of crossing the freezing level again. Manually coding the RADAT message may be needed if a flight terminates prior to reaching 400 hPa and another release is not authorized or if the data is required due to operational demands prior to 400 hPa.

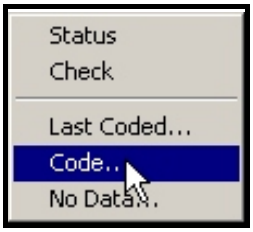


Exhibit 10-4

CAUTION: When manually coding the RADAT ensure all possible crossings of the freeing level have been recorded prior to message transmission.

10.3.2.2 The RRS Coded RADAT Message

The RRS software will automatically code the RADAT message and alarm after achieving 400 hPa. Close the Check and Status Message windows, the WMO Coded and Radat Message window is displayed. Select the FZL option in the WMO Coded Message List. (See Exhibit 10-5.) The RADAT message should display. (See Exhibit 10-6)

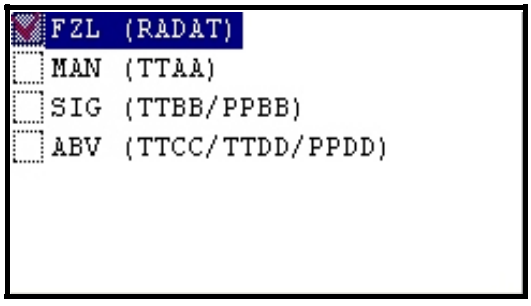


Exhibit 10-5 Message Options

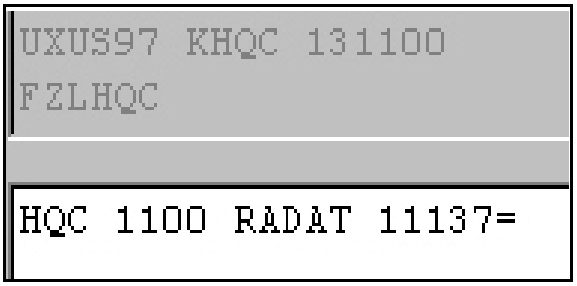


Exhibit 10-6 RADAT Message

10.3.2.3 Automatically Coded Groups of the RADAT message

The following is a breakdown of the RADAT message showing the parts that RRS software can automatically code. The RAICG and SNW section must be manually entered to the Freezing Level Message (FZL) by the observer.

CCC GGGG RADAT UU (D) (hphphp) (hphphp) (hphphp) (/n) RAICG HHMSL SNW

CCC 3 Letter Station ID

GGGG Observation time to the nearest hour (UTC)

RADAT A contraction to indicate that freezing level data follows.

UU Relative humidity to the nearest percent. Use highest RH of any of the coded crossings of the 0° isotherm. Code 00 when the RH is 100 percent. Enter "ZERO" when the entire sounding is below 0° Celsius. Code "MISG" when the surface temperature is warmer than 0° Celsius and the sounding is terminated before the 0° Celsius isotherm is reached. Coded // when RH is missing.

(D) A letter designator identifying the 0° Celsius isotherm crossing to which the coded value of UU corresponds; L for lowest, M for middle, H for highest. When only one height value is coded, this figure is omitted.

(hphphp) A geopotential height coded in hundreds of feet above MSL at which the sounding crosses the 0° Celsius isotherm. A maximum of 3 levels are selected and displayed as follows:

A. The first crossing of the 0° Celsius isotherm after release.

B. The uppermost crossing of the 0° Celsius isotherm.

C. The intermediate cross of the 0° Celsius isotherm. When there are two or more intermediate levels, the level with the highest RH is selected. If these levels have the same RH, the lowest level is selected.

D. After the levels are selected they are encoded in ascending order of height.

(/n) Indicator group to show the number of crossings of the 0° Celsius isotherm other than those whose heights are coded. If all crossings are coded, the /n group is omitted.

Manually Added Groups:

(RAICG) A contraction to indicate that icing data follows. (Only when icing is present)

Note: As a general rule RAICG should be appended if the dew point depressions at the 0° Celsius crossings are 3 degrees or less and persist for several hundred meters..

A. (HH) The altitude of icing in hundreds of feet MSL as determined from the sounding. Include the indicator "MSL" following the height; e.g., RAICG 12 MSL indicating "icing above 1200 feet mean sea level."

B. **(SNW)** Include the contraction SNW if snow is apparently causing a slow ascension rate; e.g., RAICG 13 MSL SNW.

Examples of Coded Freezing Level Data

	RH (%)	CROSSING ALTITUDE (FT)			CODED AS:
		Lowest	Middle	Upper	
Ex:	63	3500			RADAT 63L035
Ex:	89	2,300	Missing	4,200	RADAT 89H023///042

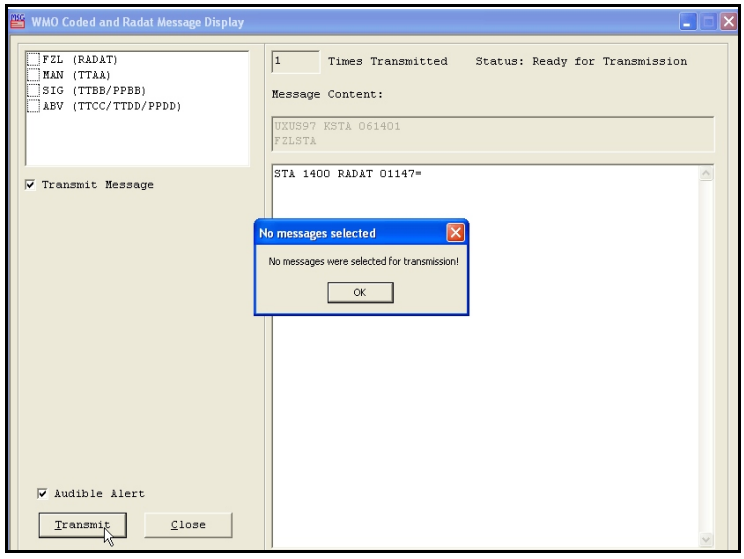


Exhibit 10-7 RADAT Message Not Selected

After the RADAT message is displayed, click on RADAT in the upper left box until a Red Check appears. After checking the RADAT message block, click on the Transmit button to send the message. Once the RADAT message is transmitted the display should update the Times Transmitted.

NOTE: If you attempt to transmit without checking the appropriate box a "No Message Selected" popup will appear. (See Exhibit 10-7).

10.3.3 Manually Coded No Data Messages

If a flight fails at release and no data above surface is available or a flight will not be taken, the observer should select the Messages option, and click on the last option No Data. The No Data Message window will appear. Select from the drop-down menu the appropriate reason or reasons for no flight being taken. (See Exhibit 10-8) The WMO Coded and Radat Message window will open with TTAA Message in the bottom right window. The MAN, SIG, and ABV messages should all be sent with the appropriate 101 groups when no flight has been taken or no data is available above the surface.

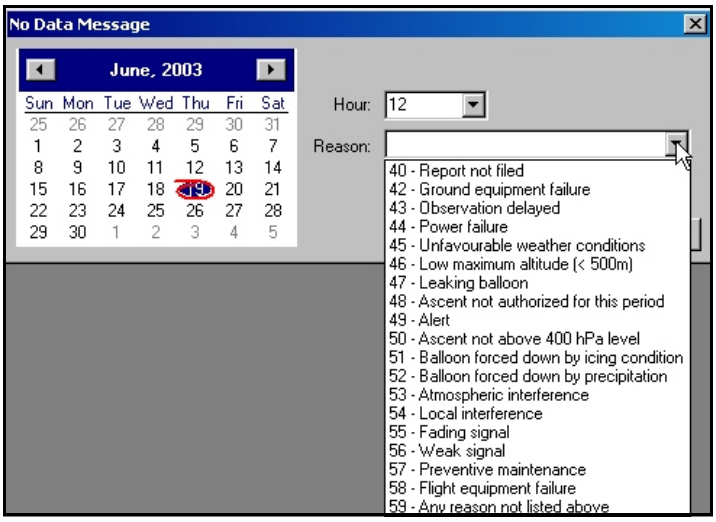


Exhibit 10-8 No Data Message with Options

AWIPS Message: USUS97 KQHC 270000
MANHQC
72403 TTAA 7700/ 72403 51515 10142=

NOTE: There are two different procedures that should be followed when a flight is missed.

1. When a flight is not possible for any reason - The observer should use the No Data option and add the proper 101 groups for the reason for no data.

2. When a flight is missed and another was possible, but not allowed - The observer must add a 10148 group after the 51515 message in the TTAA, TTBB and TTDD messages. The 10148 group signifies that an ascent was not authorized.

The 10148 group should only be used when a second release is possible, but not allowed by NCEP or other approving authorities.

10.4 Coded Message Breakdown

The observer must understand how to properly code and decode upper-air messages. The messages for the sites in the continental United States, Alaska, the Bahamas, and the Caribbean are in WMO Region IV. The sites in the Pacific Region are in WMO Region V. The coding practices in Region IV and V differ slightly, the difference being the stability index and mean low level winds are not computed for sites in Region V.

CODED MESSAGE BREAKDOWN

91285 TTAA 56001 91285 99011 28060 01009 00107 24856 01007
92787 20456 33502 85514 18265 22504 70145 07413 27011 50586
04170 33025 40758 17367 32025 30966 32764 30537 25092 40762
30545 20241 52560 30541 15421 67158 30024 10657 79756 32024
88999 77999 51515 10164 00011 10194 32003 23507=

IIiii TTAA YYGGI_d IIiii 99PPP TTTDD ddfff 00hhh TTTDD ddfff
92hhh TTTDD ddfff 85hhh TTTDD ddfff 70hhh TTTDD ddfff 50hhh
TTTDD ddfff 40hhh TTTDD ddfff 30hhh TTTDD ddfff 25hhh TTTDD
ddfff 20hhh TTTDD ddfff 15hhh TTTDD ddfff 10hhh TTTDD ddfff
88PPP 77PPP 51515 10164 000I_sI_s 10194 ddfff ddfff=

IIiii - Block number and station number

TTAA - Indicator of mandatory levels up to 100 hPa.

YYGGI_d -

YY - Day of the month, (When winds are given in knots 50 will be added to YY)

GG - Actual time of observation, to the nearest whole hour UTC

I_d - Indicator used to specify the pressure relative to the last standard isobaric surface for which a wind is reported. Reported to the nearest hundreds of hectopascals. (Used in TTAA and TTCC)

PPhhh - Mandatory pressure levels

PP - Starts with 99 - indicating surface 00 -1000 hPa 92- 925 hPa 85 - 850 hPa on until 10 - 100 hPa.

hhh - Height in geopotential meters (gpm)

Sfc to 500 hPa - Reported in whole gpm (thousands not reported) 3204 gpm reported 204
500 hPa to Term - Reported in tens of gpm 6053 gpm reported 605

TTTDD - Temperature and Dewpoint Depression Values

TTT - Dry bulb temperature in degrees Celsius. Last digit indicates if the temperature is negative or positive. Negative temperatures will have an odd number for the 3rd digit. Positive temperatures will have an even number for the last digit.

DD - Dewpoint depression. This number is subtracted from the dry bulb temperature. Numbers of less than 55, are degrees and tenths. (i.e) 49 is 4.9 degree dewpoint depression. Numbers of 56 or greater are dewpoint depressions in whole degrees. To obtain the proper dewpoint depression value subtract 50 from
any value 56 or greater. (i.e) 72 would be a dewpoint depression of 22 degrees.

ddfff - Wind Direction and Speed

dd - True wind direction to the nearest 10 degrees. Wind directions of 500 degrees or greater indicate winds with speeds greater than 100 knots. When reading the direction in this case, one should subtract 500 from the direction and remember to add 100 to the wind speed value.

fff - Wind speed in knots. Wind directions are actually rounded to the nearest 5 degrees. The unit digit of the wind direction is added to the hundreds digit of the wind speed. (i.e., 27520 is winds from 275 degrees at 20 knots.)

88hhh - TTTDD 88 - indicates tropopause

77hhh - ddfff 77 - indicates max wind group

51515 - Regional Code Groups Follow

10164 - Indicator for the stability index that follows

10194 - Indicator that the mean low level wind groups follow

ddfff ddfff - First group mean winds sfc - 5000 feet
Second group mean winds 5000 - 10000 feet

= (End of message symbol) It is a telecommunications character and is not part of the code.

91285 TTBB 56000 91285 00011 28060 11008 26057 22000 24856
33905 19057 44850 18265 55795 13257 66768 12260 77764 12039
88700 07413 99679 05817 11675 06259 22670 06661 33652 06061
44644 05666 55627 03462 66606 02068 77567 01163 88548 01271
99478 05769 11339 28364 22281 34763 33137 71358 44100 79756
31313 01102 82307 41414 59571=

IIiii TTBB YYGGa_4 IIiii 00PPP TTTDD 11PPP TTTDD 22PPP TTTDD
33PPP TTTDD 44PPP TTTDD 55PPP TTTDD 66PPP TTTDD 77PPP TTTDD
88PPP TTTDD 99PPP TTTDD 11PPP TTTDD 22PPP TTTDD 33PPP TTTDD
44PPP TTTDD 55PPP TTTDD 66PPP TTTDD 77PPP TTTDD 88PPP TTTDD
99PPP TTTDD 11PPP TTTDD 22PPP TTTDD 33PPP TTTDD 44PPP TTTDD
31313 s_r $r_a r_a$ $s_a s_a$ 8GGgg 41414 $N_h C_L h C_M C_H$=

a_4 - Type of measuring equipment used. (Used only in TTBB and TTDD.)

0 - Pressure instrument associated with wind-measuring equipment
1 - Optical theodolite
2 - Radiotheodolite
3 - Radar
4 - Pressure instrument associated with wind-measuring equipment but pressure element failed during ascent
5 - VLF-Omega
6 - Loran-C
7 - Wind profiler
8 - Satellite navigation
9 - Reserved

NOTE: a_4 is not fully implemented into the RRS software - RRS codes “0" in TTBB & TTDD.

PPP - Pressure of Significant Levels Selected

SFC to 100 hPa - Levels selected to nearest whole hPa

Above 100 hPa - Levels selected to nearest 0.1 hPa

31313 - Data on Sea Surface Temp & Sounding System Used

s_r - Solar and infrared radiation correction.

0 - No correction
1 - Correction Made
2 -

3 -
4 - No Correction Made
5 - Correction Made

$r_a r_a$ - Radiosonde Used

87 - Sippican GPS Mark II (USA)
51 - Sippican type B-2 time commutated (USA)
52 - Vaisala RS80-57 (Finland)

$s_a s_a$ -Tracking Technique/Status Used

00 - No windfinding
01 - Automatic with auxiliary optical direction finding
02 - Automatic with auxiliary radio direction finding
03 - Automatic with auxiliary ranging
05 - Automatic with multiple VLF-Omega frequencies
06 - Automatic cross chain Loran-C
07 - Automatic with auxiliary wind profiler
08 - Automatic satellite navigation

8 - Indicator
GG - Hour UTC of release
gg - Minute of release

41414 - Cloud Data $N_h C_L h C_M C_H$

N_h - Amount in eighths of all the C_L present or, if no C_L is present, the amount of all the C_M present.
C_L - Type of low cloud present
h - Height above surface of lowest cloud seen
C_M - Type of middle cloud present
C_H - Type of high cloud present

PPBB 56000 91285 90012 01009 01003 00502 90346 32002 26003
20502 90789 21005 23508 27013 91245 26512 27016 26514 9169/
31013 33026 9205/ 32523 32025 93013 31034 31538 29542 935//
30547 949// 30024 9504/ 30025 32037=

PPBB $YYGGa_4$ Iiiii $9t_n$uuu ddfff ddfff ddfff 9tnuuu ddfff ddfff ddfff=

$YYGGa_4$ Iiiii ddfff - Previously described

9 - Indicator to show winds in units or 300 meters or 1,000 foot increments
t_n - Indicates tens digit of altitude - 0 = less than 10,000 feet 1 - 10,000 - 19,000 feet
u - Indicates the unit value of altitude of winds

91285 TTCC 56002 91285 70858 76757 05508 50059 63959 11005
30378 54160 06009 20638 51161 07512 88922 82356 33014 77999=

TTDD 5600/ 91285 11922 82356 22700 76757 33517 64359 44472
64959 55364 57560 66130 47162=

PPDD 56000 91285 9556/ 32522 33015 970// 13004 98047 08012
09512 07012 99015 08012 08011 05005=

Breakdown for $101A_{df}A_{df}$ - Miscellaneous Regional Data

Code Figure	Definition
40 - 59	Reason for no report or an incomplete report
40	Report not filed
41	Incomplete report; full report to follow
42	Ground equipment failure
43	Observation delayed
44	Power failure
45	Unfavorable weather conditions
46	Low maximum altitude (less than 1500 feet above ground)
47	Leaking balloon
48	Ascent not authorized for this period
49	Alert
50	Ascent did not extend above 400 hPa level
51	Balloon forced down by icing conditions
53	Atmospheric interference
54	Local interference
55	Fading signal*
56	Weak signal*
57	Preventive maintenance
58	Flight equipment failure (transmitter, balloon, attachments, etc.)
59	Any reason not listed above

* Fading signals differ from weak signals in that "fading signals" are first received satisfactorily, then become increasingly weaker, and finally become too weak for reception, while "weak signals" are weak from the beginning of the ascent.

60 - 64: Miscellaneous

62	Radiosonde report precedes
64	Stability index follows: $000I_sI_s$

65 - 69: Doubtful Data

65	Geopotential and temperature data are doubtful between following levels: $0P_nP_nP'_nP'_n$
66	Geopotential data are doubtful between the following levels: $0P_nP_nP'_nP'_n$
67	Temperature data are doubtful between the following levels: $0P_nP_nP'_nP'_n$
68	Dew point depression is missing between the following levels: $0P_nP_nP'_nP'_n$ (not used when T_nT_n is also missing)

70 - 74 Not allocated

Breakdown for $101A_{df}A_{df}$ - Miscellaneous Regional Data (Continued)

75 - 89 Corrected Data

78	Corrected tropopause data section follows
79	Corrected maximum wind section follows
80	Corrected report for the entire report (*first** and *second** transmissions) follows
81	Corrected report of the entire PART A and/or PART B precedes
82	Corrected report of the entire PART C and/or PART D precedes
83	Corrected data for *mandatory levels*** follow
84	Corrected data for *significant levels*** follow
85	Minor error(s) in this report; correction follows
86	*Significant level(s)* not included in original report follow: $//P_nP_nP_n$ $T_nT_nT_{an}D_nD_n$ or $P_nP_nP_nT_nT_n$
87	Corrected data for *surface* follow
88	Corrected *additional data* groups follow: $101A_{df}A_{df}$ .... etc.

90 - 99

90	Extrapolated geopotential data follow: $P_nP_nh_nh_nh_n$ $(d_nd_nd_nf_nf_n)$
94	Averaged wind for the surface to 5000 foot MSL layer and the 5000 to 10000 foot MSL layer follows: ddfff ddfff (can be used in the PART A message)

NOTE: Numbers not shown have no assigned meaning or do not pertain to NWS upper-air sites.

Unless both the stability index and the mean winds are missing, the Part A message always contains two special 101 groups as follows:

10164	Group that identifies stability index.
10194	Group that identifies the mean winds.

A 5-character group $000I_sI_s$ follows the 10164 which contains the encoded stability index. The I_sI_s value that appears in the coded message for the stability index is interpreted as follows:

Stability Index Table

Code Value	Meaning
00 to 40	Stability index is 0 to 40
51 to 90	Stability index is -1 to -40
91	RH < 20% at either base or 500 mb level or calculation failed.
92	RH is missing at the base level.

The 10194 group for mean winds from the surface to 5000 feet MSL and from 5000 to 10000 feet MSL are encoded in two code groups using the format $d_md_mf_mf_mf_m$, where d_md_m is the mean direction and $f_mf_mf_m$ is the mean wind speed. If the mean wind is missing, it is reported as /////. If winds for both layers (i.e. Sfc. - 5K and 5K to 10K feet MSL) are missing, the 10194 is not sent.

Additional 101 groups as shown in the Table can be entered after the 51515 as long as the last two digits are in ascending order with the other groups. For example, if the report has been corrected, this section would appear as follows:

51515 10164 00092 10181 10194 ///// 26516=

11. RRS Observation - Flight Termination

11.1 Introduction

RRS flights may terminate in one of four ways:

1. Automatic termination by the system
2. Manual termination by the observer
3. Predetermined termination at a certain pressure level.
4. Sudden unexpected failure such as hardware or power failure.

The following sections discuss each type of termination. This chapter also describes the archival process which is essential to the flight termination process. Chapter 12 discusses the transferring of archive files.

NOTE: The flight is automatically backed up to the external hard drive when the flight is closed or when the operator elects to do a second release.

11.2 Automatic Flight Termination

RRS terminates a flight automatically when the data indicate the observation should be ended. Automatic termination can occur for a number of reasons, but the three most common are balloon burst, floating balloon, and weak or fading signals. The flight will also automatically terminate if 3 consecutive minutes of missing temperature data occurs. These situations are discussed in the following subsections. The UPS Status Window will appear indicating the software has terminated the flight. The observer should click the "OK" button to turn OFF the UPS and power to the TRS. (See Exhibit 11-1)

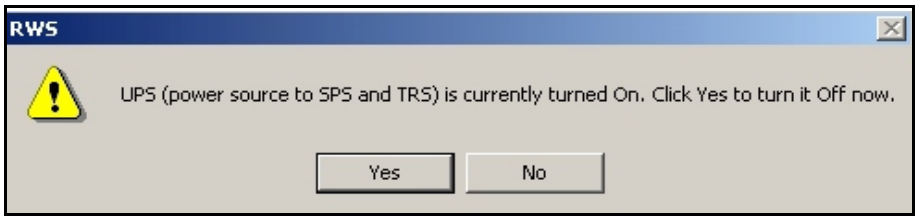


Exhibit 11-1 UPS Status Change Window

11.2.1 Balloon Burst

Most flights terminate due to balloon burst. The pressure profile is the best indication that the flight has terminated for this reason. Exhibit 11-2 illustrates a typical pressure profile that results when a balloon bursts. Notice the consistent decrease in the Smooth Pressure profile up until the burst, and then the Corrected Pressure having an abrupt deviation to the right.

The example in Exhibit 11-2 indicates balloon burst occurred just prior to 91 minutes.

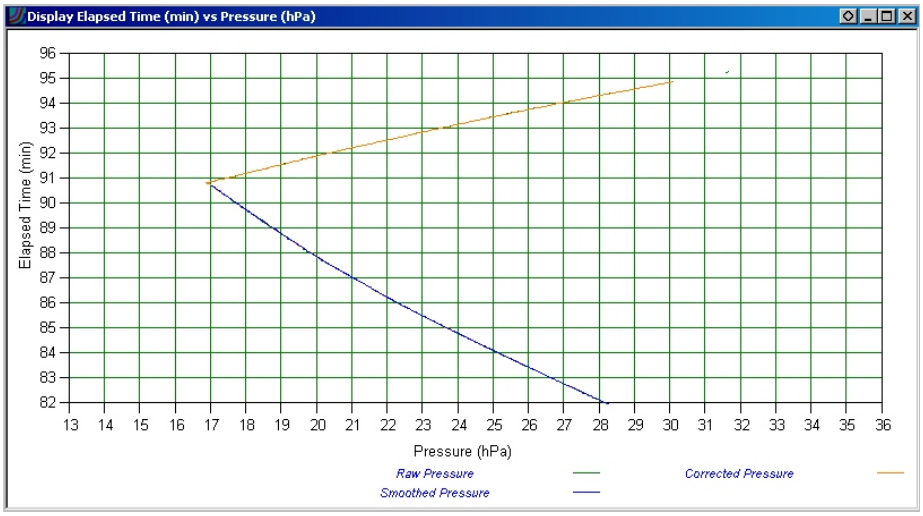


Exhibit 11-2 Termination for Balloon Burst

11.2.2 Floating Balloon

Occasionally a flight terminates because the balloon stops rising and begins floating at a nearly constant altitude, or rises so slowly that there is no point in continuing the flight.

11.2.3 Weak or Fading Signals

If the radiosonde signals become weak the data quality will usually drop off, resulting in missing data. If this continues for too long, the flight is terminated automatically.

11.2.4 Automatic Termination Procedure

When the system terminates the flight, the Check, Status, and Coded Message commands are executed automatically. As a result, either Part A, B, or C/D of the coded messages appears on the screen. The coded messages may be edited and transmitted, as was discussed in Chapter 10. It is a important to check the data for correctness before transmitting any coded messages.

11.2.4.1 Early Termination Prior to 400 hPa

There will be occasions when the flight will either automatically terminate or have to be terminated by the observer prior to reaching 400 hPa. If this occurs the first question is an additional release authorized. The following window will automatically be displayed. (See Exhibit 11-3)

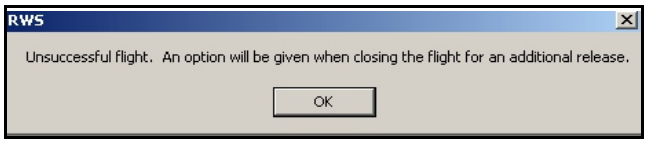


Exhibit 11-3 Unsuccessful Flight Popup

If an additional release is authorized, do the following steps:

1. Go ahead and under Flight option click on the Close option. (See Exhibit 11-4)

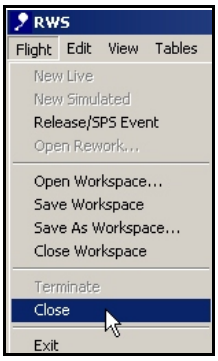


Exhibit 11-4

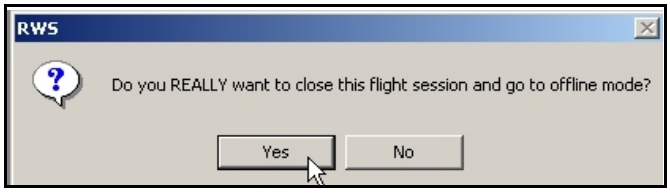


Exhibit 11-4A Response if Terming the Flight

2. After clicking on the Close option, Exhibit 11-4 opens. If you click on "Yes" the flight will close. (See Exhibit 11-4A) If you select "No" a window will popup asking if you would like to do a new release. (See Exhibit 11-5) The software will then show a popup closing the data base. (See Exhibit 11-5A)

Exhibit 11-5 When Doing an Additional Release

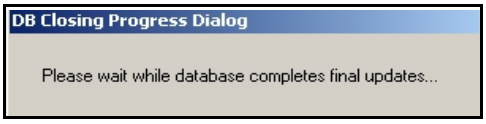


Exhibit 11-5A Closing Current Release

3. If you select "Yes" to wanting to do another release, the Hardware Status is displayed to begin the Pre-release sequence for the next release. (See Exhibit 11-6)

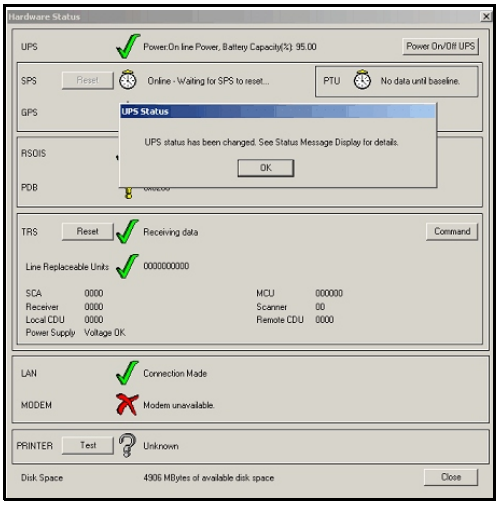


Exhibit 11-6 Hardware Status

4. After clicking on the "OK" button and closing the Hardware Status Display. Administrative display comes up and the flight continues as any other flight. (See Exhibit 11-7)

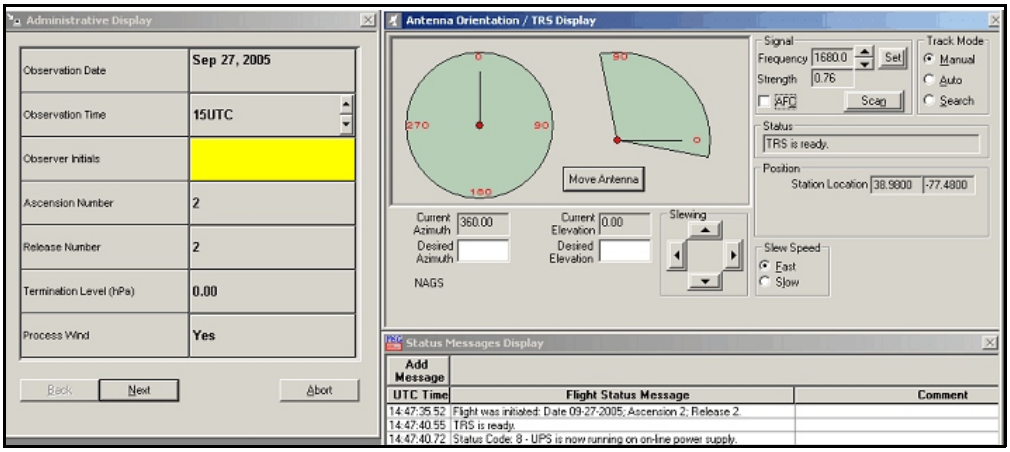


Exhibit 11-7 Pre-release Displays

5. After entering Surface Observation and clicking the "Next" button, a pop-up window appears reminding to change frequency. (See Exhibit 11-8)

Exhibit 11-8 Frequency Change Reminder

6. If after proceeding with the flight, the flight again terminates prior to 400 hPa. A window pop-ups asking which flight do you wish to use. (See Exhibit 11-9)

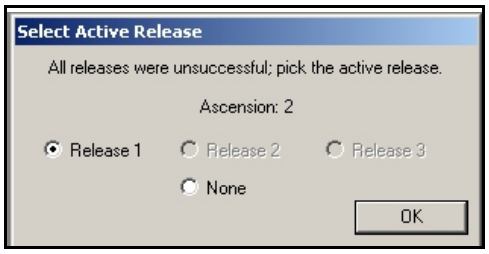


Exhibit 11-9 Select Active Release

7. After selecting the active release or none, the software will complete data processing as any other flight.

After transmitting the coded messages, exit the RRS Observation following the steps shown in Exhibit 11-19 through Exhibit 11-27.

11.2.5 Predetermined Termination

A special (asynoptic) flight can be terminated when it reaches a predetermined pressure level. This pressure level is entered on the Administrative Data screen. The flight must be allowed to reach a minimum of 400 hPa prior to automatic termination. (See Exhibit 11-10) Terminating this type of flight is identical to terminating a flight automatically (Section 11.2).

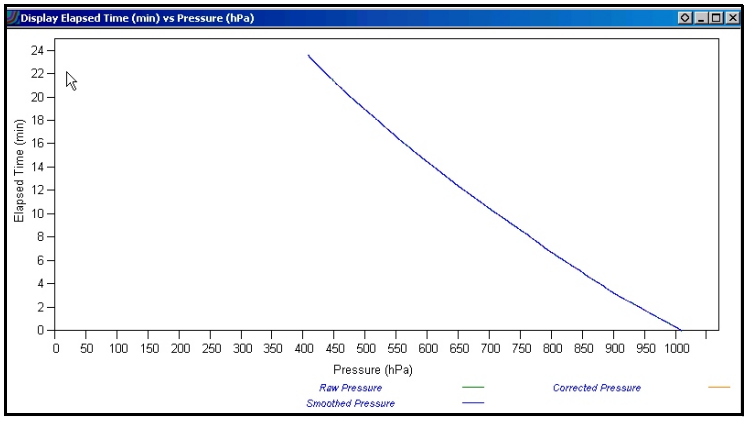


Exhibit 11-10 Predetermined Termination at 400hPa

11.3 Manual Termination

A flight may need to terminated, but RRS has not terminated the flight. In such cases terminate the flight manually. Perform the following steps to manually terminate a flight:

1. Click on the Flight option. Select “Terminate”. (See Exhibit 11-11) The “Validation”window will appear. Click “Yes”. (See Exhibit 11-12)

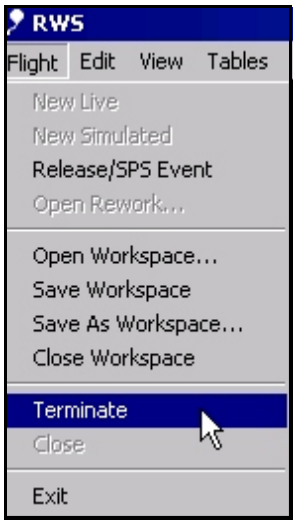


Exhibit 11-11 Manually Terminate

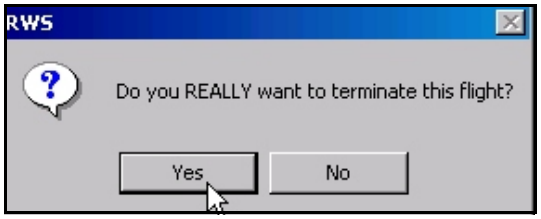


Exhibit 11-12 Validation Window

2. After clicking "Yes" in the "Validation" window. The Check, Status, and WMO Coded Message windows are generated. On top of these windows, the "UPS Power" window appears. (See Exhibit 11-13) If you click "Yes" the power to the TRS and SPS is shutdown.

   NOTE: Turning off the UPS enables the proper shutdown of the TRS and tracking equipment.

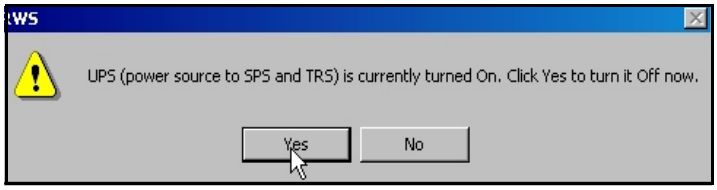


Exhibit 11-13 UPS Power Window

3. After clicking "Yes" in the "UPS Power" window, a "Validation" window appears. (See Exhibit 11-14) Click "Yes" to confirm you wish to shutdown the UPS.

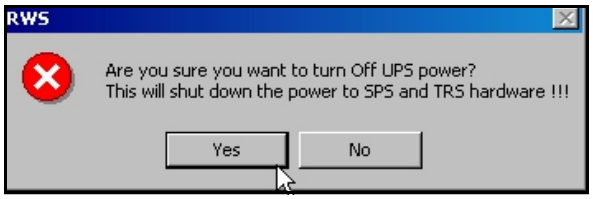


Exhibit 11-14 Validation Window

4. The window shown in Exhibit 11-15 appears alerting you that the UPS status has been turned off. Click "OK" to proceed.

Exhibit 11-15 UPS Status Change Window

5. The window shown in Exhibit 11-16 will appear. Click "OK".

Exhibit 11-16 Mark As Active Flight

6. Ensure prior to transmission that the Termination Point is correct by looking at the Processed Data Set and marking or deleting data if necessary. Transmit the coded messages that have not been transmitted. (See Exhibits 11-17 and 11-18)

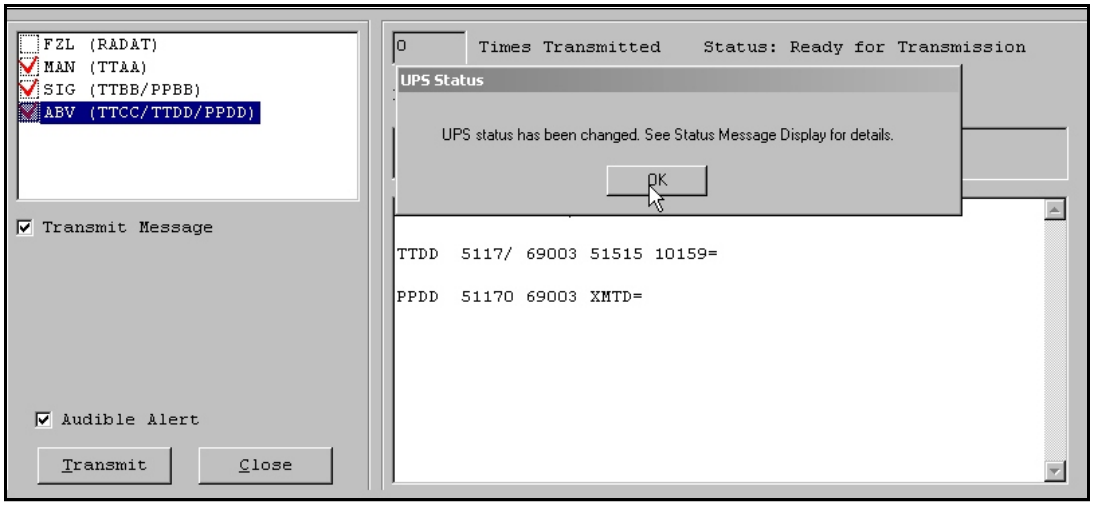


Exhibit 11-17 Transmit Coded Message and View Status Message Window

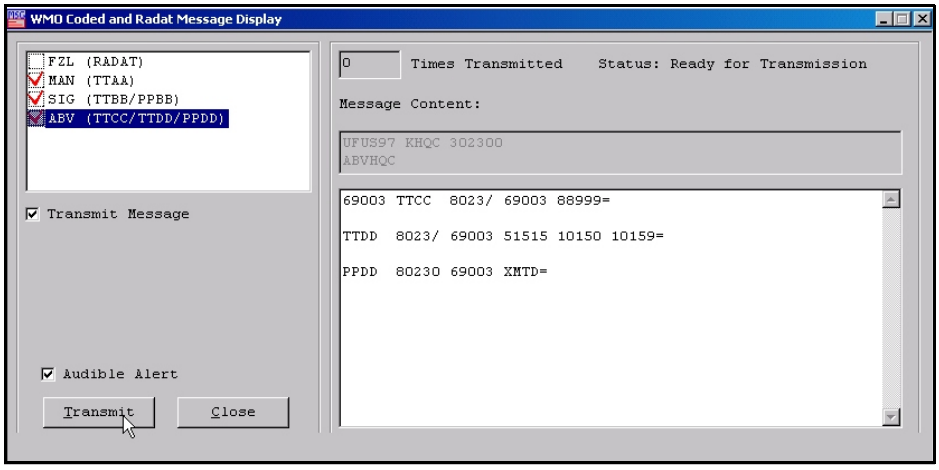


Exhibit 11-18 Transmit Coded Message

7. After transmitting the messages, open the Flight Summary display and copy or print the data required in WS Form B-29. If a problem or abnormal condition occurred save and print whatever messages or plots that may be of help. Go to the top of the RWS Main window and under the Flight option select “Close”. (See Exhibit 11-19)

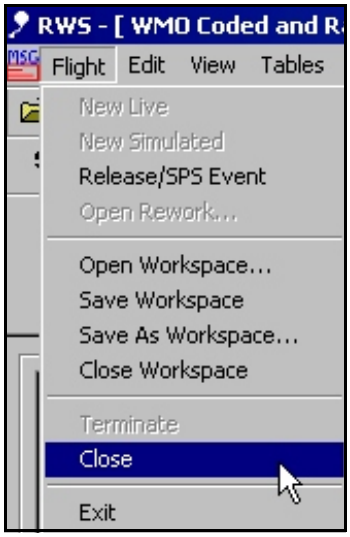


Exhibit 11-19 Close Flight

8. After selecting "Close" a "Validation" window appears. (See Exhibit 11-20) Click "Yes"

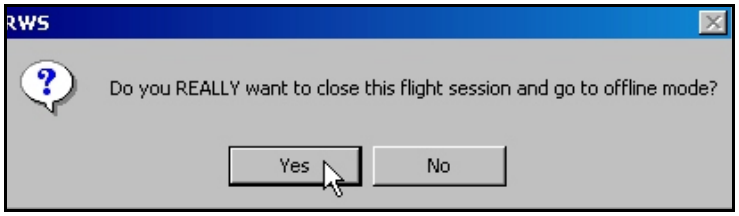


Exhibit 11-20 Validation Window

9. A final window appears stating that the flight was saved to the database and that to Archive the flight go into Utility option. Click "OK". (See Exhibit 11-21)

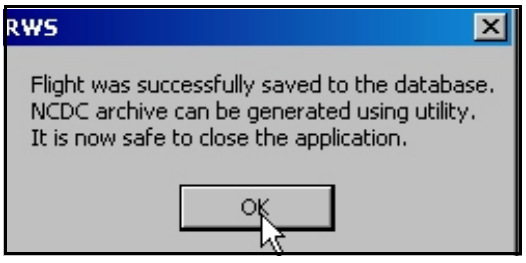


Exhibit 11-21 Close Application

10. Under "Tools" at the top of the RWS Main window select the Utilities option. (See Exhibit 11-22)

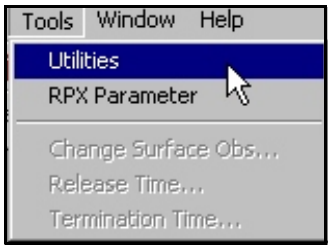
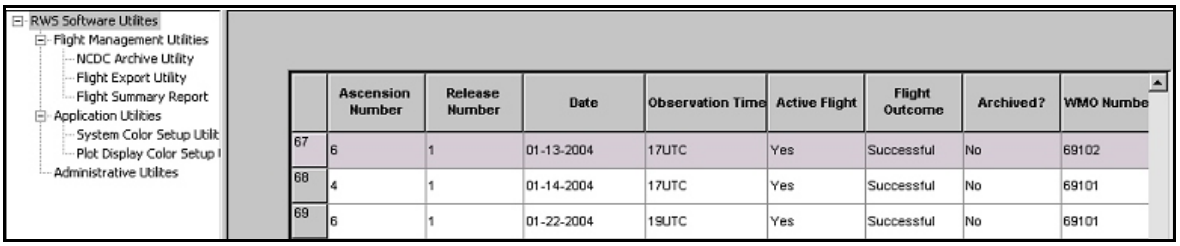


Exhibit 11-22 Enter Utilities

11. Under the "RWS Software Utilities" select the "NCDC Archive Utility". Notice the first line of the Ascension Table is grayed out. This is a flight from another site. It can not be archived. (See Exhibit 11-23)



	Ascension Number	Release Number	Date	Observation Time	Active Flight	Flight Outcome	Archived?	WMO Numbe
67	6	1	01-13-2004	17UTC	Yes	Successful	No	69102
68	4	1	01-14-2004	17UTC	Yes	Successful	No	69101
69	6	1	01-22-2004	19UTC	Yes	Successful	No	69101

Exhibit 11-23 NCDC Archive Utility

12. In the NCDC Archive Utility Display a list of ascension numbers shows which flights have and have not been archived. Observers must archive the data after each flight to ensure data is not lost due to system or equipment outages. (See Exhibit 11-24)

	Ascension Number	Release Number	Date	Observation Time	Active Flight	Flight Outcome	Archived?	WMO Numbe
6	17	1	04-02-2003	05UTC	Yes	Successful	No	69991
7	39	1	05-07-2003	22UTC	Yes	Unsuccessful	Yes	69990
8	41	1	05-08-2003	15UTC	Yes	Successful	Yes	69990
9	42	1	05-08-2003	20UTC	Yes	Successful	Yes	69990
10	43	1	05-09-2003	15UTC	Yes	Successful	Yes	69990
11	44	1	05-12-2003	18UTC	Yes	Successful	Yes	69990
12	45	1	05-13-2003	15UTC	Yes	Successful	Yes	69990
13	46	1	05-14-2003	13UTC	Yes	Successful	Yes	69990
14	47	1	05-15-2003	13UTC	Yes	Successful	Yes	69990
15	48	1	05-19-2003	19UTC	Yes	Successful	No	69990
16	49	1	05-20-2003	14UTC	Yes	Successful	No	69990
17	50	1	05-23-2003	14UTC	Yes	Successful	No	69990
18	51	1	05-23-2003	19UTC	No	Unsuccessful	No	69990
19	52	1	05-23-2003	19UTC	Yes	Unsuccessful	No	69990
20								

Archive

Exhibit 11-24 Select Ascension to Archive

13. After selecting the flight you wish to archive, by clicking on the far left column, and then clicking on the "Archive" button, a window appears allowing you to designate a subdirectory to store the file. The default subdirectory is C:\RWS|RWS\NCDC. subdirectory. (See Exhibit 11-25A) You may also insert a CD into the "D" drive and then select the "D" drive to copy the Archive data to by pressing "OK". (See Exhibit 11-25B)

NOTE: Placing the data on a CD provides additional security of the flight data should a hardware failure occur. The Archive data will be Zipped and sent by FTP to NCDC from the RRS workstation using instructions in Chapter 12.

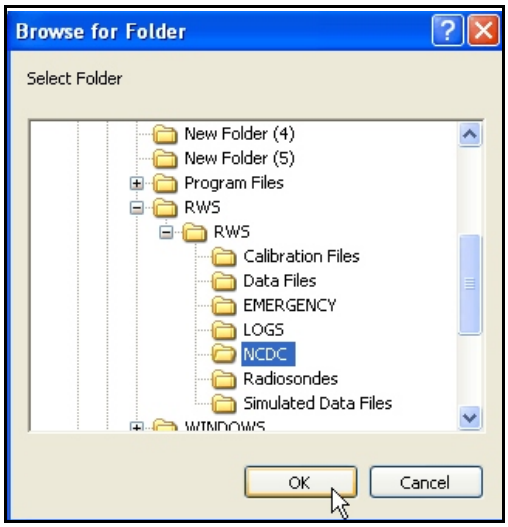


Exhibit 11-25A NCDC Archive

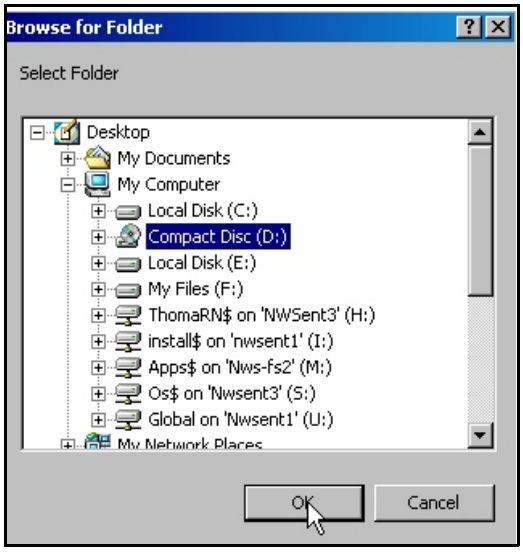


Exhibit 11-25B Archive to CD Drive

14. Verify the flight was archived by going back and viewing the Archive Table. The block in the "Archive?" column should have a "Yes" entered. (See Exhibit 11-26)

	Ascension Number	Release Number	Date	Observation Time	Active Flight	Flight Outcome	Archived?	WMO Numbe
6	17	1	04-02-2003	05UTC	Yes	Successful	No	69991
7	39	1	05-07-2003	22UTC	Yes	Unsuccessful	Yes	69990
8	41	1	05-08-2003	15UTC	Yes	Successful	Yes	69990
9	42	1	05-08-2003	20UTC	Yes	Successful	Yes	69990
10	43	1	05-09-2003	15UTC	Yes	Successful	Yes	69990
11	44	1	05-12-2003	18UTC	Yes	Successful	Yes	69990
12	45	1	05-13-2003	15UTC	Yes	Successful	Yes	69990
13	46	1	05-14-2003	13UTC	Yes	Successful	Yes	69990
14	47	1	05-15-2003	13UTC	Yes	Successful	Yes	69990
15	48	1	05-19-2003	19UTC	Yes	Successful	Yes	69990

Exhibit 11-26 Verify Flight Archived

15. After archiving the flight, go back to the Flight option window and select "Exit". (See Exhibit 11-27) This will shut the RWS software down.

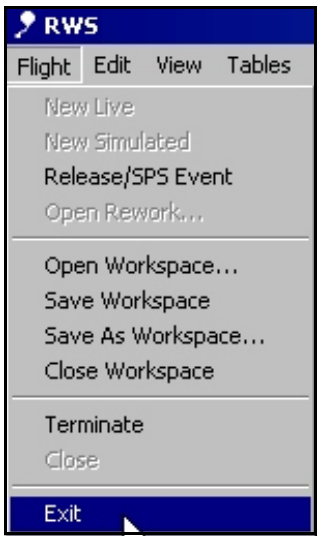


Exhibit 11-27 Exit Flight

11.4 Sudden Unexpected Flight Termination

This may be caused by a power failure or hardware failure. Proper procedure is to enter the "Rework" option and select the last flight. After bringing up the flight and verifying the data accuracy and the point of termination, send the coded messages. Follow the procedures shown in Exhibit 11-19 through Exhibit 11-27, after completing, close and archive the flight.

NOTE: If the software crashes, the software will automatically go to "Rework". In Rework, the flight may be transmitted up to 6 hours after flight termination, but RRS does not allow the flight to be continued after a crash or power failure.

12. Transferring Archive Files

12.1 Introduction

After completion of each flight, the data will be archived on the RRS workstation. It will be sent to the National Climatic Data Center (NCDC) electronically using Internet Explorer from the RRS workstation. The primary method of transmitting the archive data to NCDC will be through the use of File Transfer Protocol (FTP).

NOTE: Unless authorized by WSH, the archive will not be sent to NCDC on hard media, such as a CDROM.

12.2 FTP Instructions for Sending Upper Air Data to NCDC

12.2.1 Archiving the Flight

1. On the RRS workstation, in the Offline Mode select the Tools Option and go into the Utilities Window. (See Exhibit 12-1) Select Archive and locate the flight to be archived. After clicking on the "Archive" button, the window comes up with the NCDC subdirectory selected. Click "OK" to place the 3 Archive files in the C:\RWS\RWS\NCDC subdirectory. (See Exhibits 12-2 to 12-4)

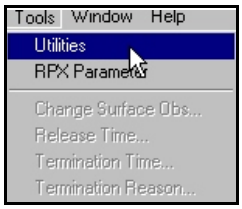


Exhibit 12-1
Utilities Window

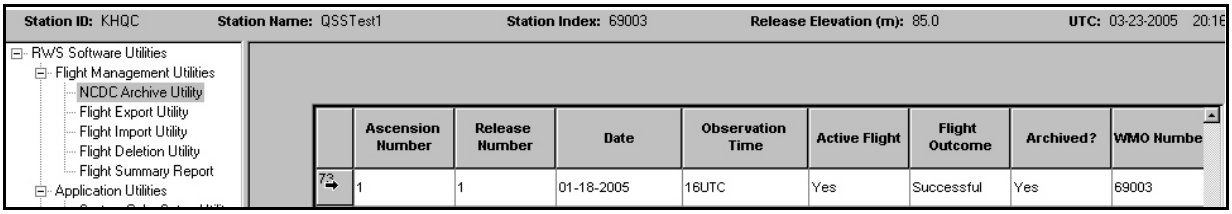


Exhibit 12-2 Selecting Flight to Archive

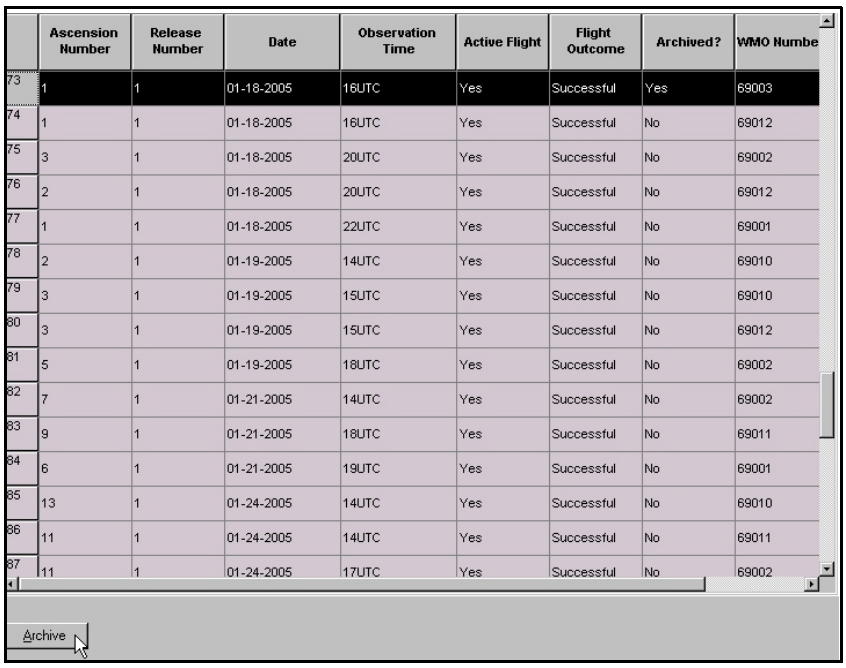


Exhibit 12-3 Archiving Selected Flight

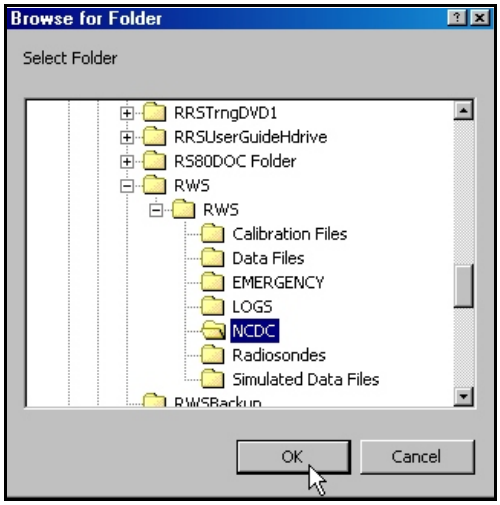


Exhibit 12-4 Archiving to NCDC Subdirectory

NOTE: These files should be placed in the C:\RWS\RWS\NCDC subdirectory at the end of each flight. Each file will begin with either H, T, or B followed by Ascent Number. (Example Ascent # 245 - files would be: H245, T245, and B245)

a. "H" file (Archive header file)
b. "T" file (Archive thermal file)
c. "B" file (Archive BUFR file)

2. After archiving the files, close the RWS software.

12.2.2 Locate, Name and Zip the Archive Files

Do the following steps to get the files Zipped and ready to transmit to NCDC:

1. On the desktop, double click on the "Archive" icon. (See Exhibit 12-5) When the Archive window opens, locate the 3 files just archived. (See Exhibit 12- 6)

Exhibit 12-5 Archive Folder

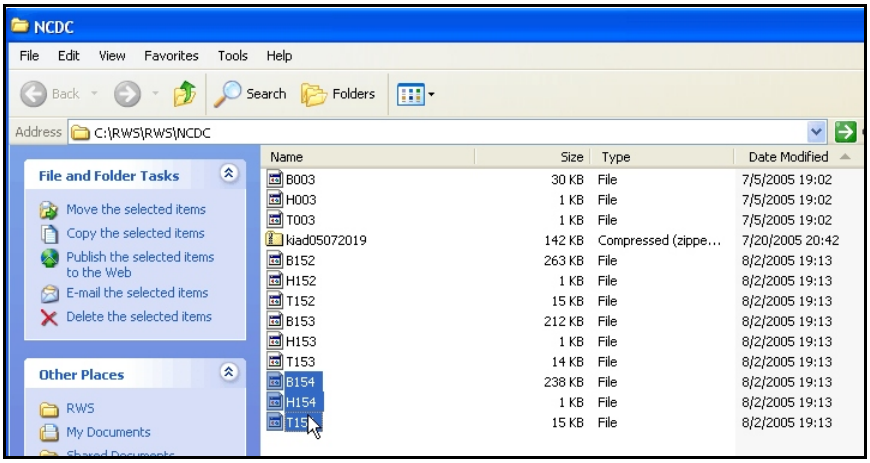


Exhibit 12-6 Select Files to Zip

2. Highlight the three files by holding the control key down and clicking each file. Then, right click and select "Send To" from the drop-down list and select "Compressed (zipped) Folder.". (See Exhibit 12-7 and Exhibit 12-8)

NOTE: If the files are not in order, sort by clicking on the date modified header in the top right corner of the window.

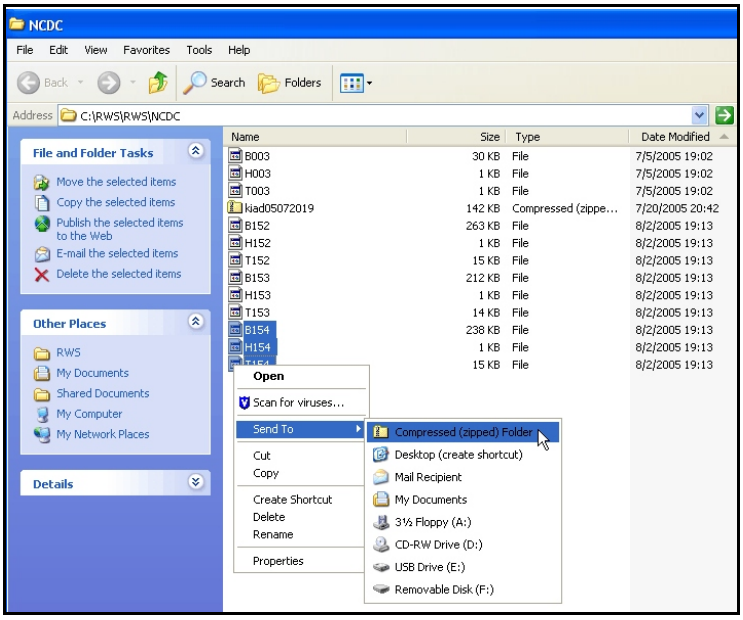


Exhibit 12-7 Selecting Files to be Zipped

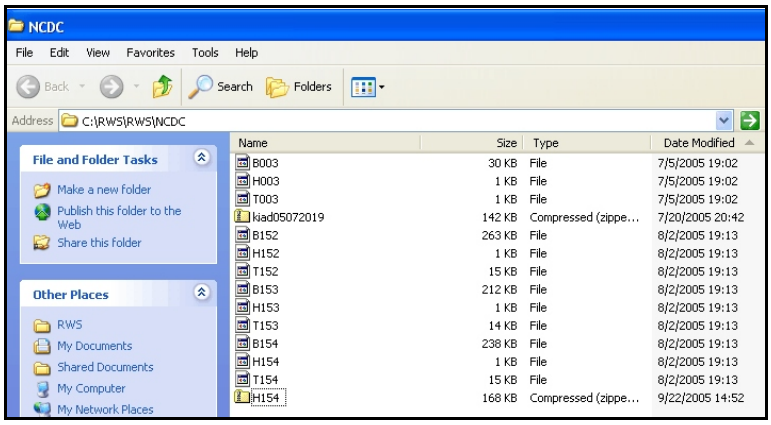


Exhibit 12-8 Zipped File Before Renaming

NOTE: After the files are zipped, the size of the newly created file should be smaller than the combined file size of the three files verifying the files were zipped. . (See Exhibit 12-8) Verify the correct files were zipped, close the window.

3. After sending to the Zipped folder. Go into the window and right click on the newly named zipped folder and select “Rename”. (See Exhibit 12-9) Use the naming convention described after Exhibit 12-9.

Exhibit 12-9
Renaming Zip File

4. File Naming conventions MUST be followed exactly or they will not be retrieved by NCDC. Name the file according to the rules below:

The files MUST be named as follows: xxxxyymmddhh

(all lower case letters - CAPITAL LETTERS WILL NOT BE RECEIVED)

Breakdown:

xxxx - The 4-letter Stn Id (see Appendix C of WSOH-10 for current list of ID's)
yy - The last 2-digits of data year (00-99)
mm - The 2-digit month of the year (01-12)
dd - The 2-digit day of the month (01-31)
hh - The 2-digit hour of the day in UTC (00-23)

NOTE: Do not add anything else - The ZIP Program will add: .zip - indicating this is a zip file. Never add ".exe" this will create problems at NCDC.

Example: kchs05042600 or kmpx05042612 (See Exhibit 12-10)

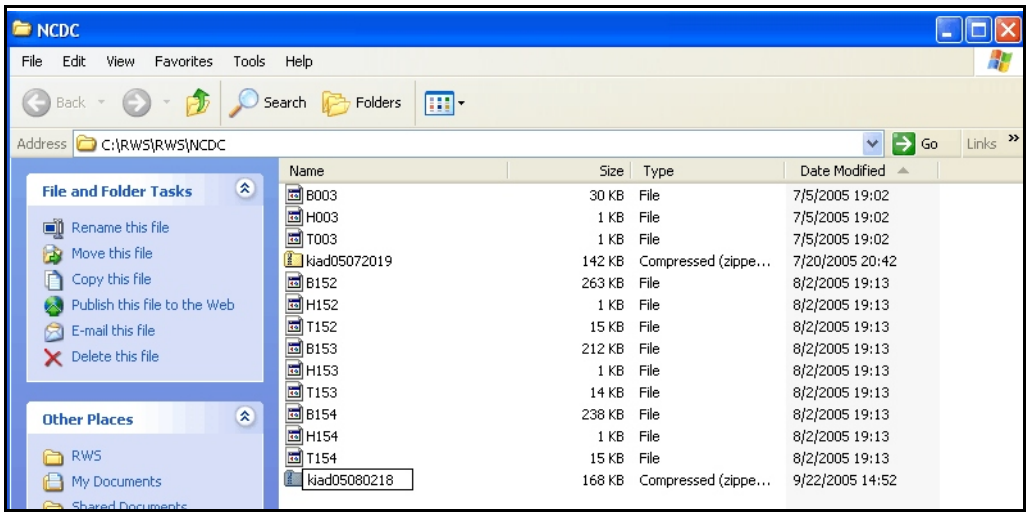


Exhibit 12-10 Zipped File Renamed with Station ID and Date/Time

12.2.3 Send Zipped File to NCDC

Do the following to send the zipped file to NCDC by FTP:

1. Double click on the "NCDC Upload" icon on the Desktop. Decrease the window size and move it so both the "Archive" and "NCDC Upload" windows are viewable on the desktop. window. (See Exhibit 12-11 and Exhibit 12-12)

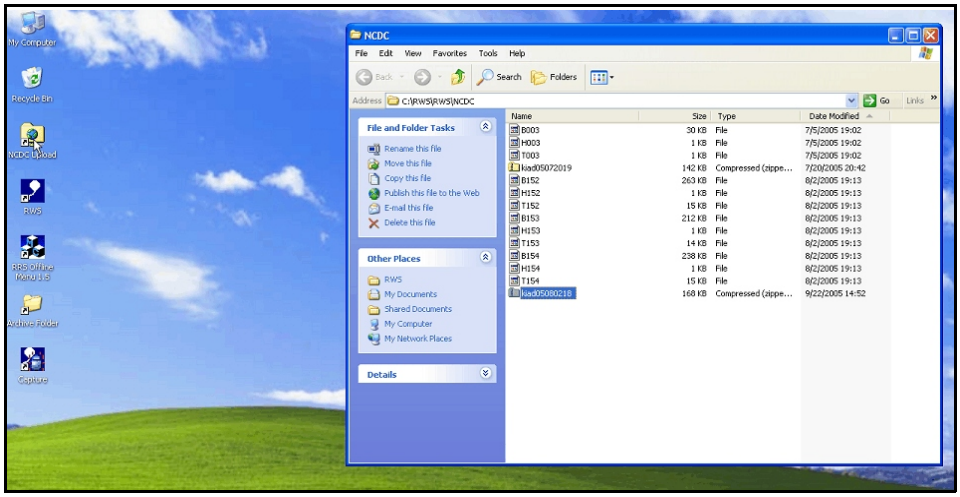


Exhibit 12-11 Opening NCDC Upload Icon on the Desktop

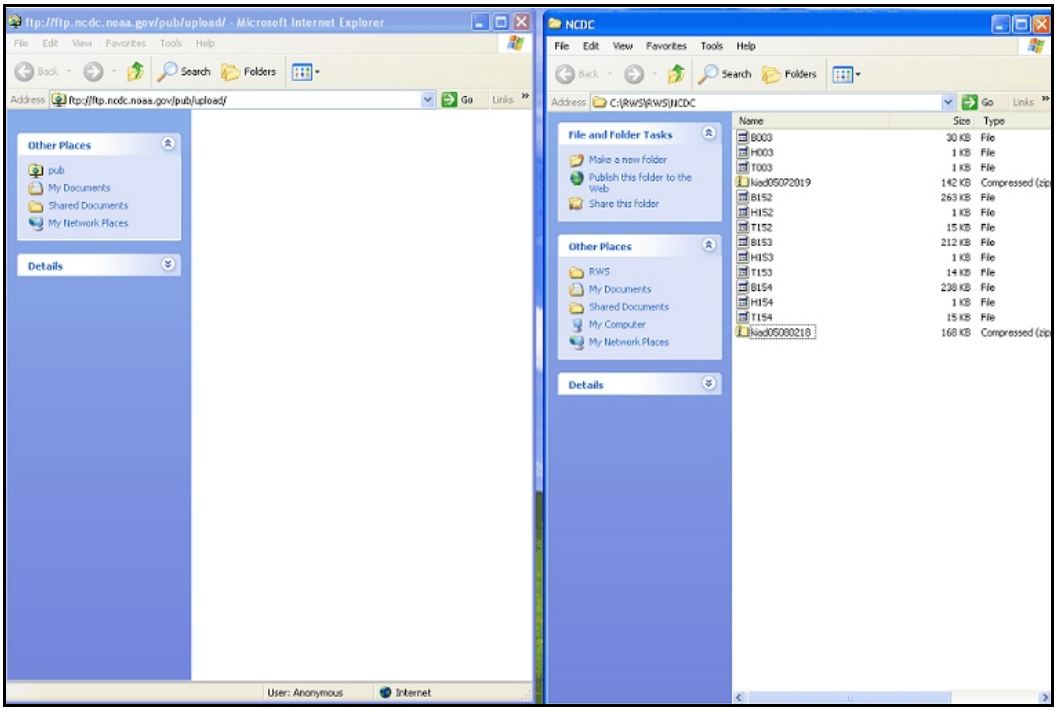


Exhibit 12-12 Resize Windows Prior to Sending Zip File

4. Click and drag the Zipped file in the C:\RWS\RWS\NCDC window over to the NCDC Upload window. The file will automatically be sent. (See Exhibit 12-13)

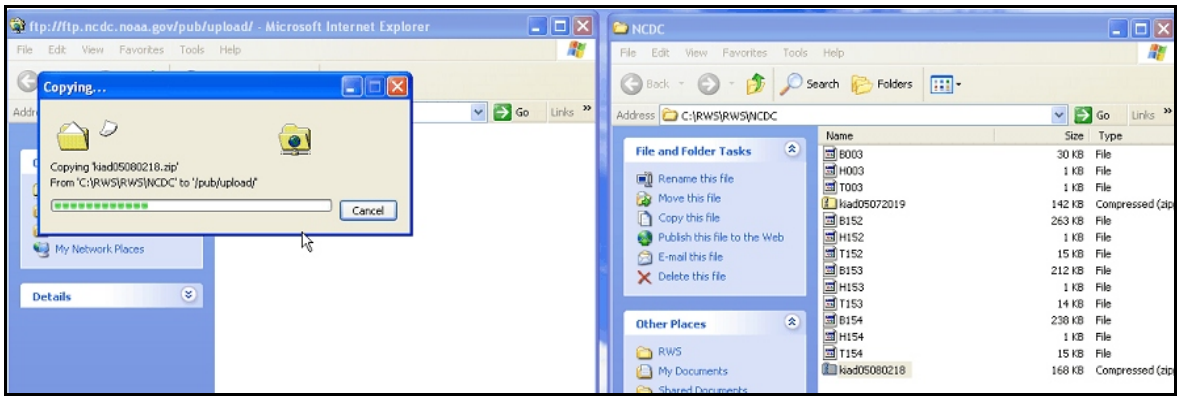


Exhibit 12-13 Zipped File Moved to NCDC/Upload Window with Automatic Transmission Occurring

5. The NCDC window will indicate that the file has been received. (See Exhibit 12-14)

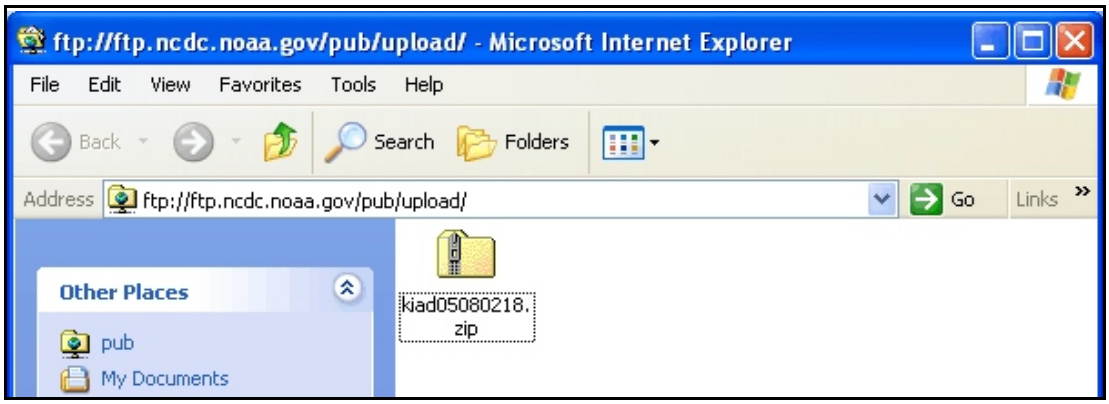


Exhibit 12-14 Zip File Transferred to NCDC by FTP

6. Verify the name and file size look reasonable, if so, you have successfully sent the Zipped file. Close the window, you are finished with the Archiving, Zipping and transmitting of the Zipped files by FTP to NCDC all the normal post flight activities.

13. Special In-flight Situations

13.1 Introduction

RRS flights may encounter numerous problems that require close attention by the operator. It is impractical to capture each unusual flight occurrence, but some of the most common occurrences follow.

13.2 Descending and Re-ascending Balloon

The descending/re-ascending balloon situation may occur with icing, severe turbulence, or due to a balloon being under-inflated. It is the observer's responsibility to look closely at the data to ensure the flight should be allowed to continue or be terminated. The key to making this decision is looking at the data and seeing if data following the occurrence looks reasonable and compares with a previous sounding or those of nearby stations. (See Exhibits 13-1 and 13-1A)

Key indicators include:

Irregular pressure profile plot
Check Messages show an abrupt change in the temperature lapse rate (possibly negative)
Status Messages with Descend/Re-ascend Messages

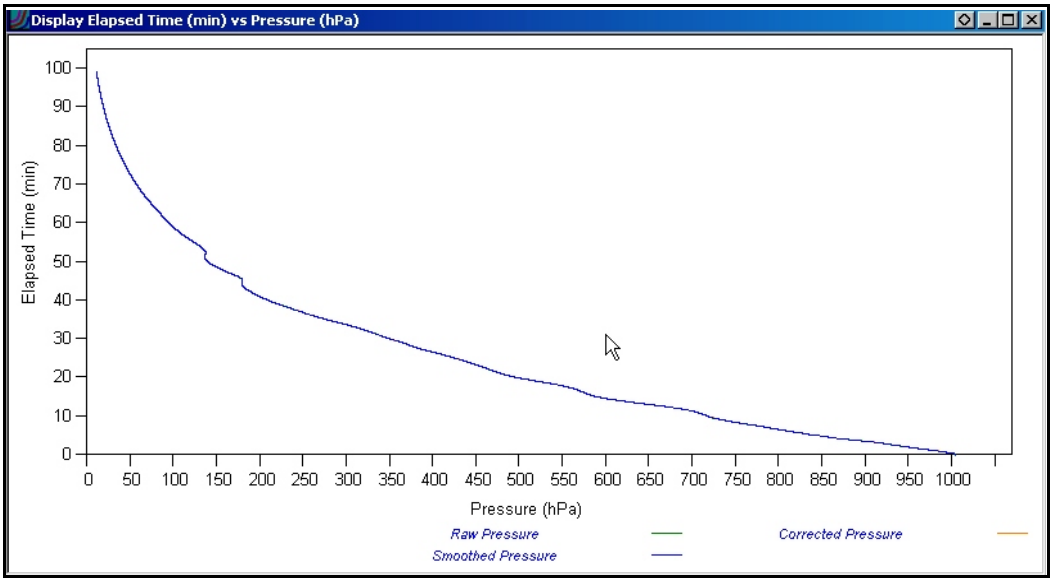
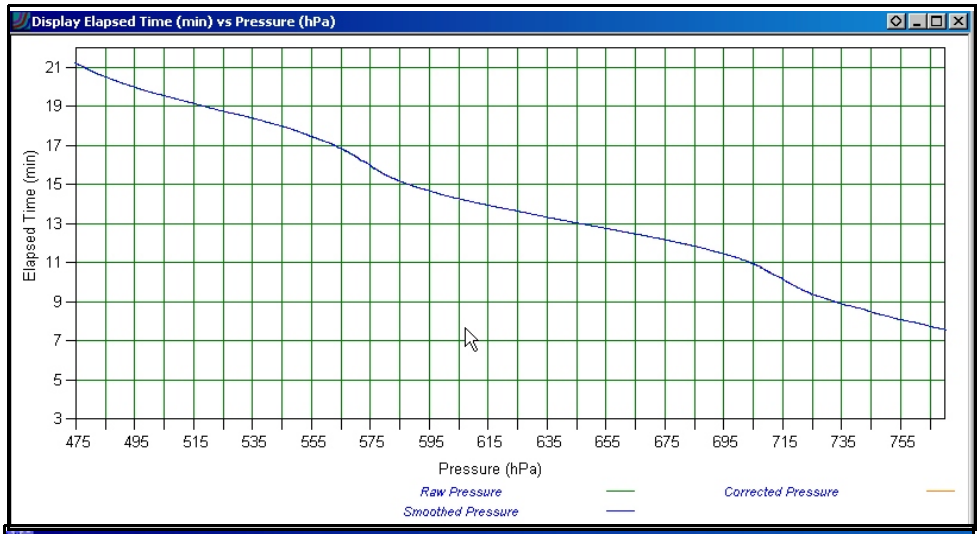


Exhibit 13-1 Pressure Profile Indicating Fluctuations

If Exhibit 13-1 is zoomed in at the locations showing a wave in the pressure profile and the processed tabular data is displayed. A definite slowing of the ascension rate and heights is found. See Exhibits 13-1A and 13-1B.

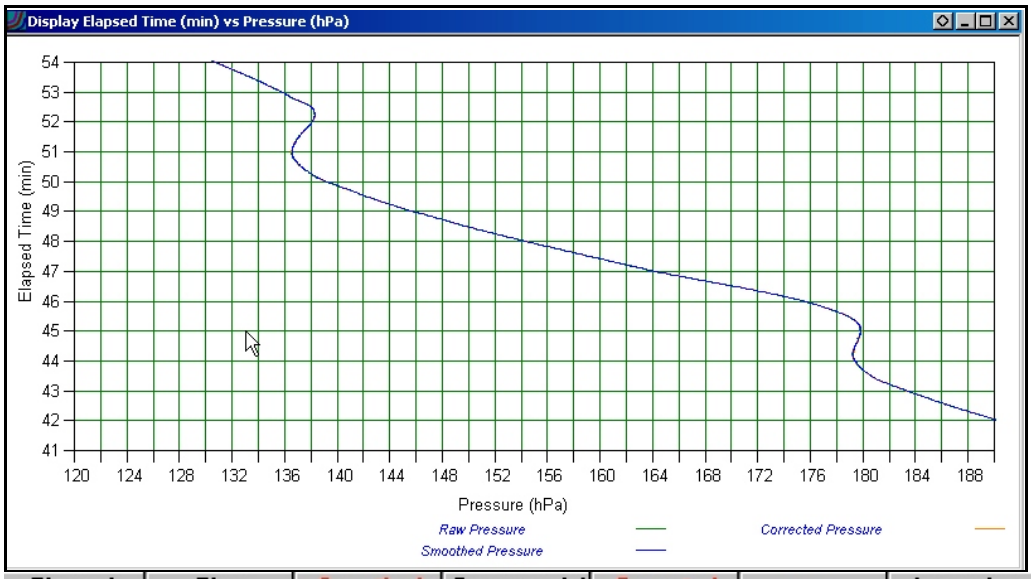


Processed Tabular Display

Elapsed Time (Minutes)	Time Stamp (UTC)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)	Ascension Rate (m/s)
2.00	18:23:17	945.45	592	5.00	53.8	4.5
2.50	18:23:47	930.18	724	3.72	56.9	4.4
3.00	18:24:17	915.51	853	2.59	61.3	5.3
3.50	18:24:47	894.55	1040	0.98	63.9	6.5
4.00	18:25:17	872.19	1243	-0.94	69.8	5.8
4.50	18:25:47	856.58	1386	-2.17	71.1	5.1
5.00	18:26:17	839.49	1546	-3.58	75.8	4.8
5.50	18:26:47	825.82	1676	-4.83	82.2	4.5
6.00	18:27:17	811.22	1816	-6.10	88.1	4.4
6.50	18:27:47	798.32	1941	-7.30	92.3	4.1
7.00	18:28:17	785.75	2064	-8.19	92.3	4.3
7.50	18:28:47	772.27	2198	-9.24	91.4	4.7
8.00	18:29:17	757.53	2347	-10.46	90.3	4.7
8.50	18:29:47	744.50	2480	-11.54	89.4	4.3
9.00	18:30:17	732.57	2604	-11.76	89.2	3.7
9.50	18:30:47	723.11	2704	-11.79	45.9	2.8
10.00	18:31:17	716.61	2773	-5.18	28.5	2.3
10.50	18:31:47	710.48	2841	-1.98	26.2	2.4
11.00	18:32:17	703.90	2916	-1.23	25.6	3.2
11.50	18:32:47	693.57	3033	-1.08	25.3	4.6

Exhibit 13-1A Pressure Plot with Processed Data Indicating Slowing of Ascent Rate at Base of Wave Beginning at Minute 9

Exhibit 13-1B indicates a more significant wave in the pressure profile and a more abrupt change in the ascent rate being noted beginning just prior to minute 44 and again after minute 50.



Elapsed Time (Minutes)	Time Stamp (UTC)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)	Ascension Rate (m/s)
42.00	19:03:17	190.33	12188	-64.04	27.9	4.1
42.50	19:03:47	186.66	12308	-62.75	27.7	3.8
43.00	19:04:17	183.35	12418	-62.73	27.6	3.4
43.50	19:04:47	180.64	12510	-61.01	27.5	2.2
44.00	19:05:17	179.42	12552	-58.53	27.2	0.7
44.50	19:05:47	179.40	12552	-56.12	27.0	-0.2
45.00	19:06:17	179.82	12538	-52.92	26.7	0.3
45.50	19:06:47	178.88	12572	-50.30	26.4	2.6
46.00	19:07:17	175.54	12695	-49.99	26.2	5.4
46.50	19:07:47	170.26	12894	-50.78	26.1	7.2
47.00	19:08:17	164.23	13128	-51.26	26.1	7.2
47.50	19:08:47	159.26	13328	-51.50	26.0	6.6
48.00	19:09:17	154.47	13526	-53.18	26.1	6.5
48.50	19:09:47	149.90	13718	-54.93	26.2	6.1
49.00	19:10:17	145.84	13893	-56.62	26.3	5.5
49.50	19:10:47	142.28	14049	-56.87	26.3	4.9
50.00	19:11:17	139.21	14187	-57.31	26.3	3.8
50.50	19:11:47	137.29	14275	-58.00	26.4	2.0
51.00	19:12:17	136.55	14309	-58.07	26.4	0.2
51.50	19:12:47	137.08	14285	-57.57	26.4	-1.2
52.00	19:13:17	138.08	14239	-55.29	26.3	-0.7
52.50	19:13:47	138.04	14241	-53.76	26.1	1.8
53.00	19:14:17	135.79	14346	-52.91	26.0	3.7
53.50	19:14:47	133.40	14461	-51.91	25.9	4.1
54.00	19:15:17	130.76	14591	-52.38	25.9	5.2

Exhibit 13-1B Pressure Waves at Minutes 43 and 51 with Processed Data Indicating Temporary Negative Ascent Rates

Check Messages may also indicate abrupt temperature lapse rate changes. (See Exhibit 13-1C) Status Messages will indicate each Descending/Reascending event. (See Exhibit 13-1D)

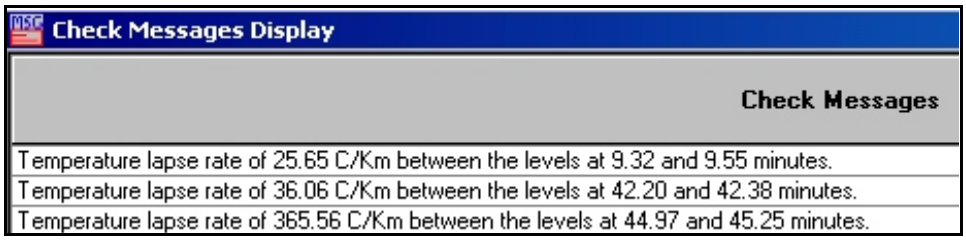


Exhibit 13-1C Check Messages with Abrupt Temp Lapse Rate Change

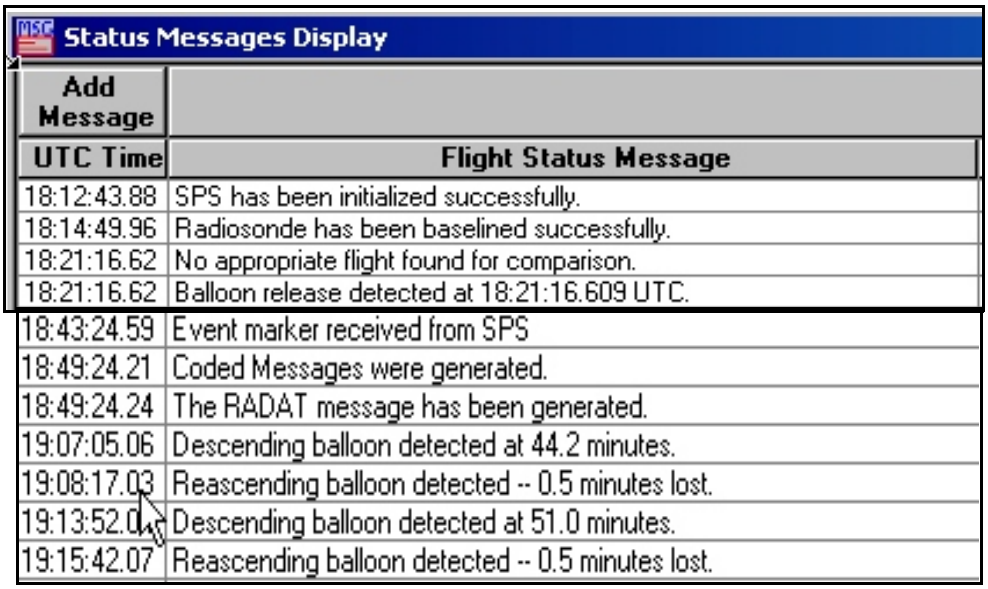


Exhibit 13-1D Status Messages with Descending and Reascending Callups

13.3 Erratic Temperature and Relative Humidity Profile

There may be occasions when the temperature and relative humidity readings show erratic data. The primary tools for finding problems with the radiosonde's data is to look at the Temperature and RH data plots and the Check Messages. (See Exhibit 13-2A and 13-2B)

Erratic data may be indicated on the Temperature or Temperature and RH plots by either an abrupt shift in the plot or by continual shifts in the plotted data. (See Exhibits 13-2B to 13-2D)

NOTE: Review the appropriate plot and mark the data over the period considered erratic to ensure levels are not selected from the questionable data.

The initial call-ups within the Check Messages provide a clue that the temperature is changing abruptly during certain periods of the flight

Check Messages
Temperature lapse rate of 41.96 C/Km between the levels at 28.97 and 29.15 minutes.
Temperature lapse rate of 43.82 C/Km between the levels at 34.37 and 34.50 minutes.
Temperature lapse rate of 24.35 C/Km between the levels at 41.32 and 41.52 minutes.
Temperature lapse rate of 38.85 C/Km between the levels at 50.80 and 50.88 minutes.
Temperature lapse rate of 28.34 C/Km between the levels at 86.27 and 86.52 minutes.
Temperature lapse rate of 47.28 C/Km between the levels at 86.59 and 86.65 minutes.

Exhibit 13-2A Check Message with Erratic Temperature Call-ups

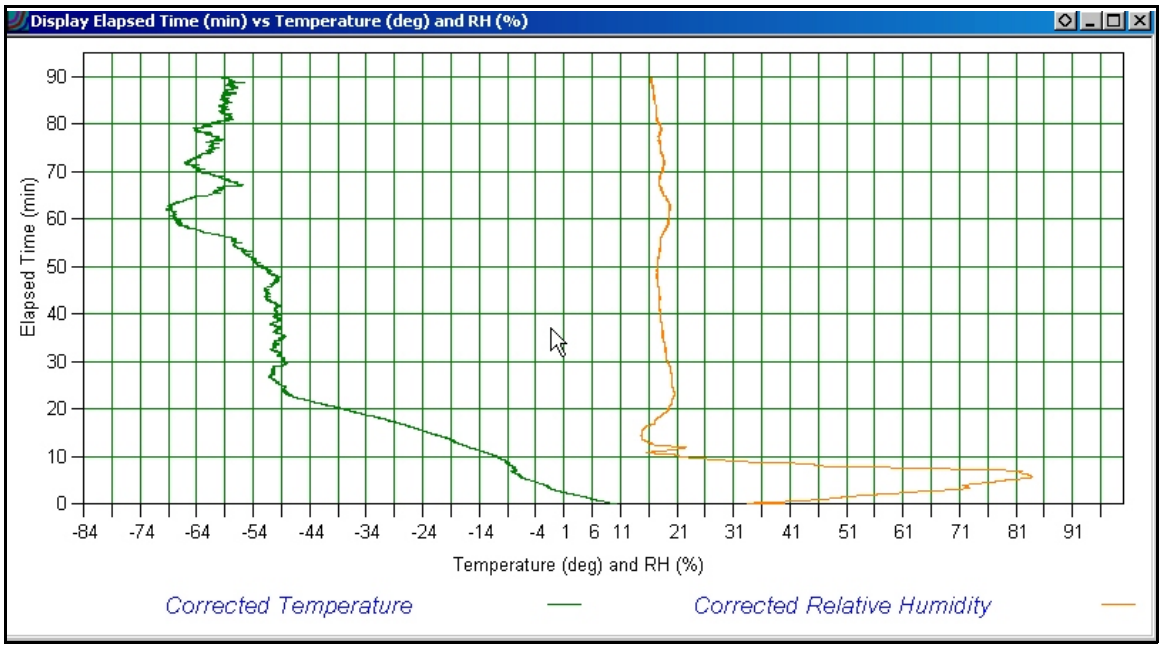


Exhibit 13-2B Temperature and RH Plot Showing Erratic Data

The plotted temperature and RH data shows a zigzag and widening of the temperature profile beginning just prior to 30 minutes into the flight. Going back and investigating the various parts of the flight by zooming in on those areas with temperature call-ups illustrates clearly that a problem with the temperature is evident by the deviations over a short time span. (See Exhibits 13-2C and 13-2D)

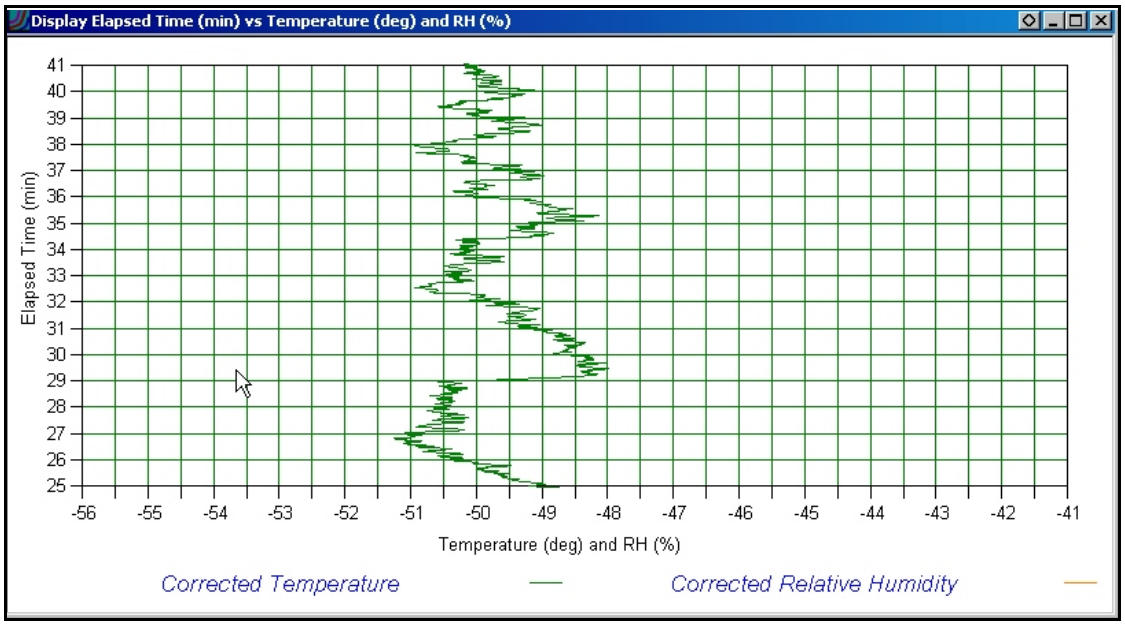


Exhibit 13-2C Temperature Plot Indicating Erratic Data 25 to 41 Minutes

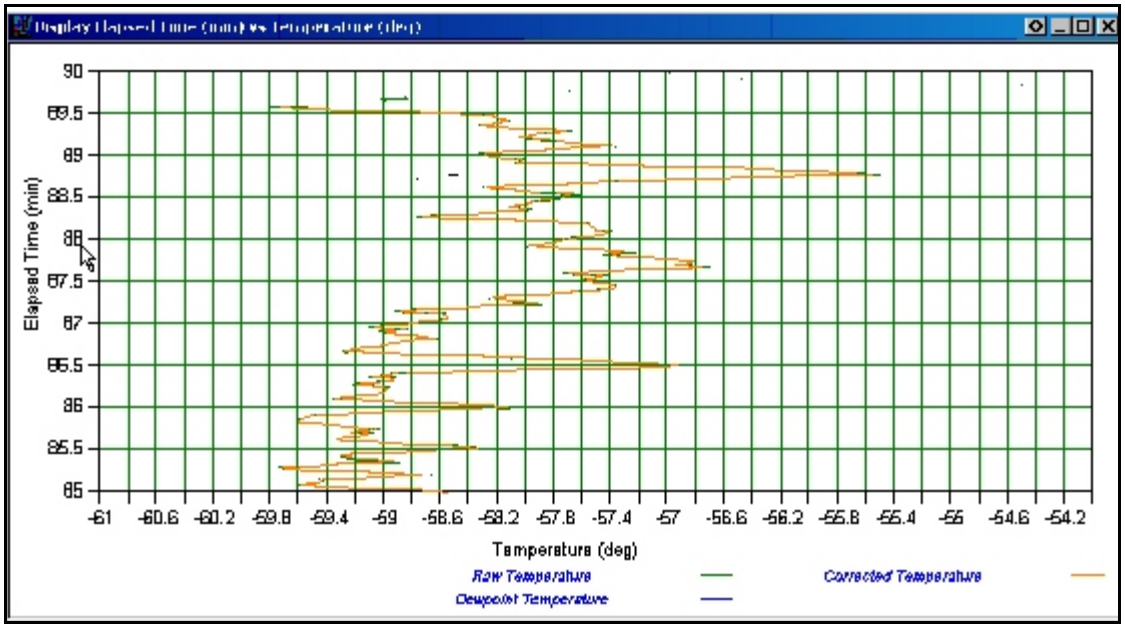


Exhibit 13-2D Temperature Plot with Erratic Data from 85 to 90 Minutes

NOTE: A second release may not be necessary for bad RH data, unless the RH data is considered essential by the lead forecaster or NCEP.

Along with looking at the Check Message for temperature call-ups and the plotted data the coded messages will reflect the abrupt shifts by coding levels close together with significant temperature changes. (See Exhibit 13-2E)

```
TTDD  6317/ 69102 11949 57163 22789 67161 33688 69561 44608
64562 55586 59763 66554 60363 77534 55963 88426 66362 99362
60163 11339 62362 22333 59363 33294 64762 44268 57563 55232
60163 66225 57963 77203 59363 88201 56964 99199 59363 11189
56764 22183 58763 33178 55564 44170 59563=
```

Exhibit 13-2E TTDD Message with Abrupt Temp Shift

A significant temperature change can be seen in the 4th line of the coded message. The temperature at 20.3 hPa is -59.3 degrees and the temperature at 20.1 hPa is -56.9 degrees and 2.4 degree change which is an extreme change over such a small amount of time. The height difference for these two levels is only 80 meters.

WMO Levels Tabular Display

Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Corrected Temperature (C)	Geopotential Height (m)	Dewpoint Temperature (C)	Temperature Lapse Rate (C/km)	Level ID	Reason
86.27	20.33	-59.20	25979	-72.51	-5.0	21	TEMP
86.52	20.07	-56.91	26059	-70.60	2.1	21	TEMP
86.59	20.00	-58.24	26080	-71.71	8.5	14	STD P

Exhibit 13-2F WMO Levels Showing Unrealistic Temperature Change Over 80 Meters

13.4 Erratic Wind Data

Flights will occasionally have questionable wind data. The Check Message will indicate changes in wind direction and speed. Speed changes will be identified if a 20 knot or greater change is detected within 300 meters of a level. Direction changes of 20 degrees within 300 meters of a level will also cause a check message to appear.

The observer must also look closely at the wind plot to decide if the plotted data looks realistic. (See Exhibits 13-3A through 13-3C)

Check Messages Display

Check Messages
Wind direction change of up to 21.20 degrees from minutes 62.55 and 64.25.
Wind speed change of up to 34.07 knots from minutes 65.57 and 68.27.
Wind direction change of up to 53.72 degrees from minutes 78.02 and 79.45.
Wind direction change of up to 45.94 degrees from minutes 84.68 and 86.12.

Exhibit 13-3A Wind Speed and Direction Check Messages

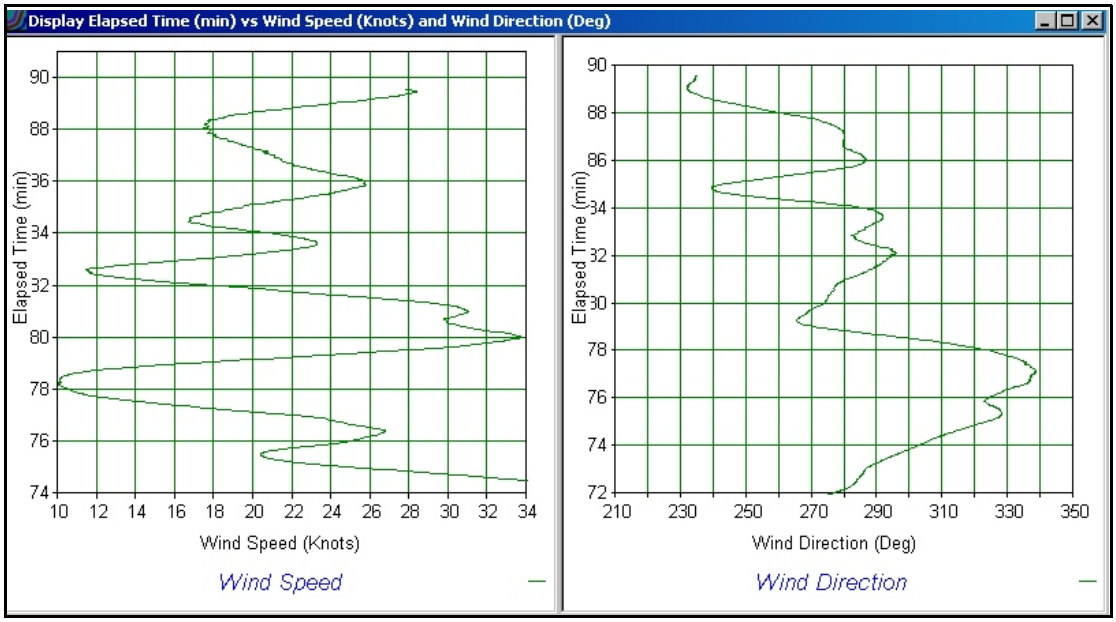


Exhibit 13-3B Wind Plot Showing 24 Knot Wind Speed Change from Minute 78 to 80 and Direction Change of 75 Degrees from Minute 77 to 79

Another way to tell if the wind data is questionable is by looking at the coded messages. (See Exhibit 13-3C)

```
PPDD  63170 69102 958// 27542 96014 27555 27566 30560 966//
27010 97027 26530 29037 32010 979// 27534 98018 29028 28511
23528=
```

Exhibit 13-3C Winds Above 100 hPa Indicate 24 Knot Speed Change from Minute 77 to 79

13.5 Data Dropouts

Data dropouts may occur with any or all of the sensor elements. The primary tool for identifying this problem is looking at data plots. Data plots show a radical departure from readings both before and after the data dropout. (See Exhibit 13-4A to13-4C)

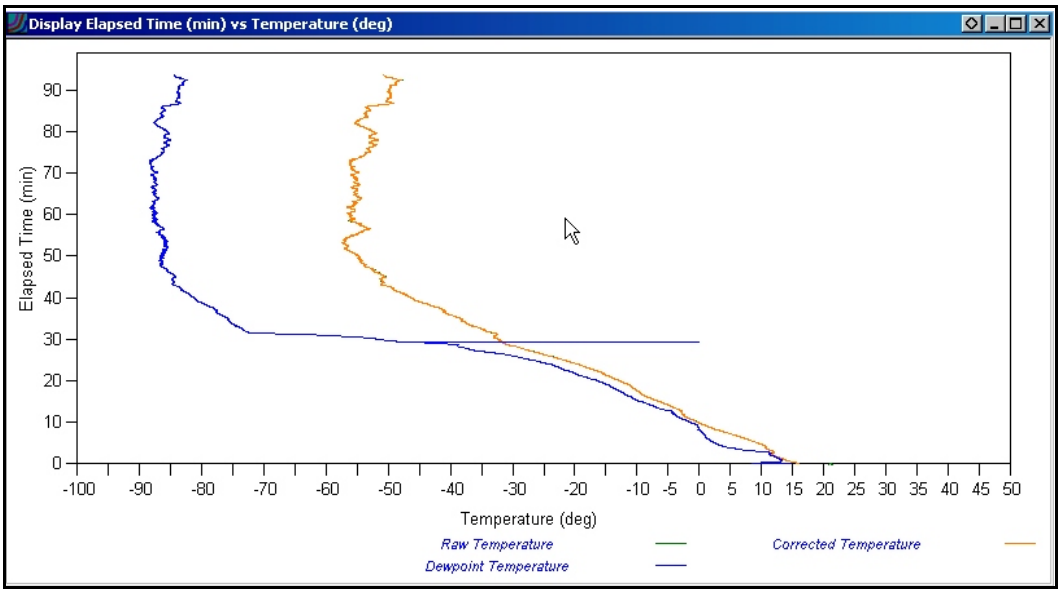


Exhibit 13-4A Data Dropout Illustrated by Dewpoint Dropout

After identifying or recognizing a data dropout the operator should expand the plotted area to find the begin and end points of the data dropout. (See Exhibit 13-4B)

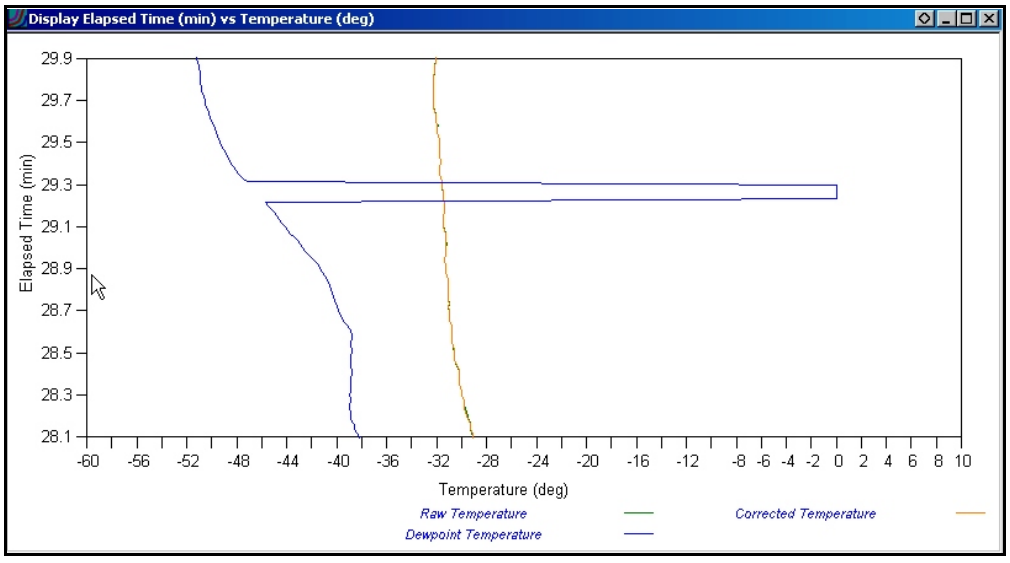


Exhibit 13-4B Expanded View of Dewpoint Dropout

Go to the Processed Data and locate the data dropout area. (See Exhibit 13-4C)

Processed Tabular Display

Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Dewpoint Temperature (C)
29.08	379.34	7680	-43.89
29.17	378.22	7702	-45.02
29.25	0.00	-1	0.00
29.33	376.08	7742	-47.56

Exhibit 13-4C Processed Data with Dropouts in Dewpoint and Height Data

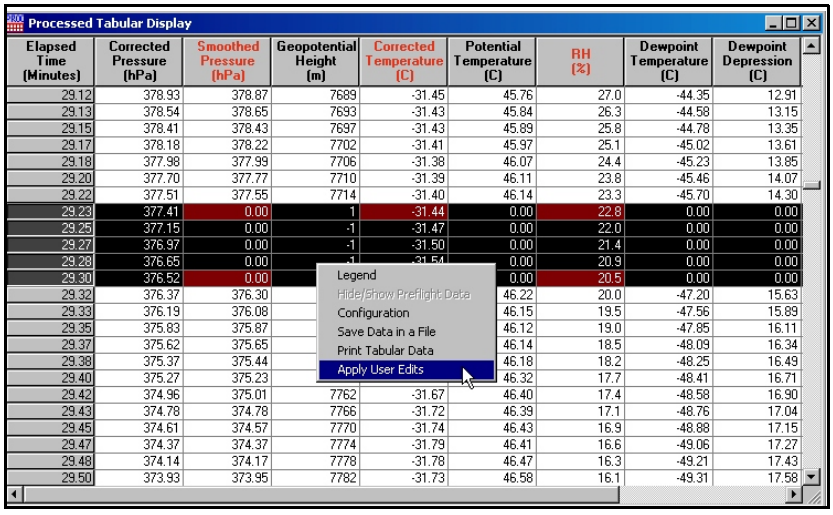
The WMO coded message (TTBB) indicates the data dropout in the dewpont depression at 378 hPa and 376 hPa. Notice the dewpoint depression for the level at 387 hPa was 58 or -08 degrees less than the temp and the level following the 376 hPa level is 89 or -39 degrees less than the temperature at that level. (See Exhibit 13-4D)

```
69990 TTBB  77190 69990 00006 16013 11005 15857 22993 14616
33960 12404 44952 11804 55938 12005 66891 10457 77758 00311
88749 00912 99694 02717 11606 09327 22497 16348 33469 19143
44387 30958 55378 31500 66376 31500 77347 33189 31313 45508
81913 41414 8747/ 51515 10181=
```

Exhibit 13-4D TTBB Message with Levels Showing Dewpoint Depression Dropout

The observer should mark the data points with data dropouts and "Apply User Edits" to have the data interpolated. (See Exhibit 13-4E and 13-4F)

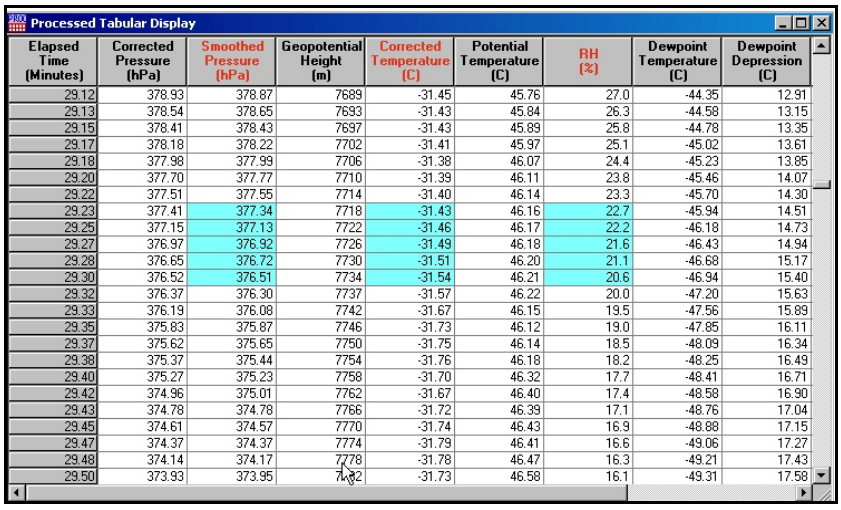
CAUTION: Be sure to "Left Click and Drag" the mouse over the entire area to be "Marked". Clicking on each individual point may miss points and does not work if the configuration has been changed from data points each second.



Elapsed Time (Minutes)	Corrected Pressure (hPa)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	Potential Temperature (C)	RH (%)	Dewpoint Temperature (C)	Dewpoint Depression (C)
29.12	378.93	378.87	7689	-31.45	45.76	27.0	-44.35	12.91
29.13	378.54	378.65	7693	-31.43	45.84	26.3	-44.58	13.15
29.15	378.41	378.43	7697	-31.43	45.89	25.8	-44.78	13.35
29.17	378.18	378.22	7702	-31.41	45.97	25.1	-45.02	13.61
29.18	377.98	377.99	7706	-31.38	46.07	24.4	-45.23	13.85
29.20	377.70	377.77	7710	-31.39	46.11	23.8	-45.46	14.07
29.22	377.51	377.55	7714	-31.40	46.14	23.3	-45.70	14.30
29.23	377.41	0.00	1	-31.44	0.00	22.8	0.00	0.00
29.25	377.15	0.00	-1	-31.47	0.00	22.0	0.00	0.00
29.27	376.97	0.00	-1	-31.50	0.00	21.4	0.00	0.00
29.28	376.65	0.00	-1	-31.54	0.00	20.9	0.00	0.00
29.30	376.52	0.00	-1	-31.57	0.00	20.5	0.00	0.00
29.32	376.37	376.30	7737	-31.57	46.22	20.0	-47.20	15.63
29.33	376.19	376.08	7742	-31.67	46.15	19.5	-47.56	15.89
29.35	375.83	375.87	7746	-31.73	46.12	19.0	-47.85	16.11
29.37	375.62	375.65	7750	-31.75	46.14	18.5	-48.09	16.34
29.38	375.37	375.44	7754	-31.76	46.18	18.2	-48.25	16.49
29.40	375.27	375.23	7758	-31.70	46.32	17.7	-48.41	16.71
29.42	374.96	375.01	7762	-31.67	46.40	17.4	-48.58	16.90
29.43	374.78	374.78	7766	-31.72	46.39	17.1	-48.76	17.04
29.45	374.61	374.57	7770	-31.74	46.43	16.9	-48.88	17.15
29.47	374.37	374.37	7774	-31.79	46.41	16.6	-49.06	17.27
29.48	374.14	374.17	7778	-31.78	46.47	16.3	-49.21	17.43
29.50	373.93	373.95	7782	-31.73	46.58	16.1	-49.31	17.58

Exhibit 13-4E Marked Data Prior to Applying User Edits

Exhibit 13-4F shows the marked data after applying "User Edits". The missing data is now interpolated.



Elapsed Time (Minutes)	Corrected Pressure (hPa)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	Potential Temperature (C)	RH (%)	Dewpoint Temperature (C)	Dewpoint Depression (C)
29.12	378.93	378.87	7689	-31.45	45.76	27.0	-44.35	12.91
29.13	378.54	378.65	7693	-31.43	45.84	26.3	-44.58	13.15
29.15	378.41	378.43	7697	-31.43	45.89	25.8	-44.78	13.35
29.17	378.18	378.22	7702	-31.41	45.97	25.1	-45.02	13.61
29.18	377.98	377.99	7706	-31.38	46.07	24.4	-45.23	13.85
29.20	377.70	377.77	7710	-31.39	46.11	23.8	-45.46	14.07
29.22	377.51	377.55	7714	-31.40	46.14	23.3	-45.70	14.30
29.23	377.41	377.34	7718	-31.43	46.16	22.7	-45.94	14.51
29.25	377.15	377.13	7722	-31.46	46.17	22.2	-46.18	14.73
29.27	376.97	376.92	7726	-31.49	46.18	21.6	-46.43	14.94
29.28	376.65	376.72	7730	-31.51	46.20	21.1	-46.68	15.17
29.30	376.52	376.51	7734	-31.54	46.21	20.6	-46.94	15.40
29.32	376.37	376.30	7737	-31.57	46.22	20.0	-47.20	15.63
29.33	376.19	376.08	7742	-31.67	46.15	19.5	-47.56	15.89
29.35	375.83	375.87	7746	-31.73	46.12	19.0	-47.85	16.11
29.37	375.62	375.65	7750	-31.75	46.14	18.5	-48.09	16.34
29.38	375.37	375.44	7754	-31.76	46.18	18.2	-48.25	16.49
29.40	375.27	375.23	7758	-31.70	46.32	17.7	-48.41	16.71
29.42	374.96	375.01	7762	-31.67	46.40	17.4	-48.58	16.90
29.43	374.78	374.78	7766	-31.72	46.39	17.1	-48.76	17.04
29.45	374.61	374.57	7770	-31.74	46.43	16.9	-48.88	17.15
29.47	374.37	374.37	7774	-31.79	46.41	16.6	-49.06	17.27
29.48	374.14	374.17	7778	-31.78	46.47	16.3	-49.21	17.43
29.50	373.93	373.95	7782	-31.73	46.58	16.1	-49.31	17.58

Exhibit 13-4F Marked Data After Applying User Edits

Exhibit 13-4G shows the TTBB message after applying "User Edits" notice the levels at 378 and 376 hPa are gone and there is no dewpoint depression for any of the levels at or near 00 at the point in the flight.

```
69990 TTBB  77190 69990 00006 16013 11005 15857 22993 14616
33960 12404 44952 11804 55938 12005 66891 10457 77758 00311
88749 00912 99694 02717 11456 20547 22450 21348 33387 30958
44386 31159 55374 31768 66363 32971 77350 32585 88349 32988
99347 33189 11221 51184 22203 50584 33184 53783 44144 57579
55123 53183 66112 56381 77110 55582 31313 45508 81913 41414
8747/ 51515 10181=
```

Exhibit 13-4G TTBB Message After Applying User Edits Levels with 00 Dewpoint Depression Gone

13.6 Inaccurate Relative Humidity Above Surface Layer

The relative humidity sensor at times may indicate significantly lower readings immediately off surface due to poor initial aspiration through the humidity duct and usually last for less than a minute.

NOTE: The RH sensor has a dry bias that may show relative humidity readings as low as 1% between layers early in the flight. Care should be taken in editing this data. The readings may be as much as 10% too low, but should not be edited unless found to be totally off from other meteorological products such as water vapor imagery or previous or surrounding sounding data. Paragraph 13.7 provides additional details.

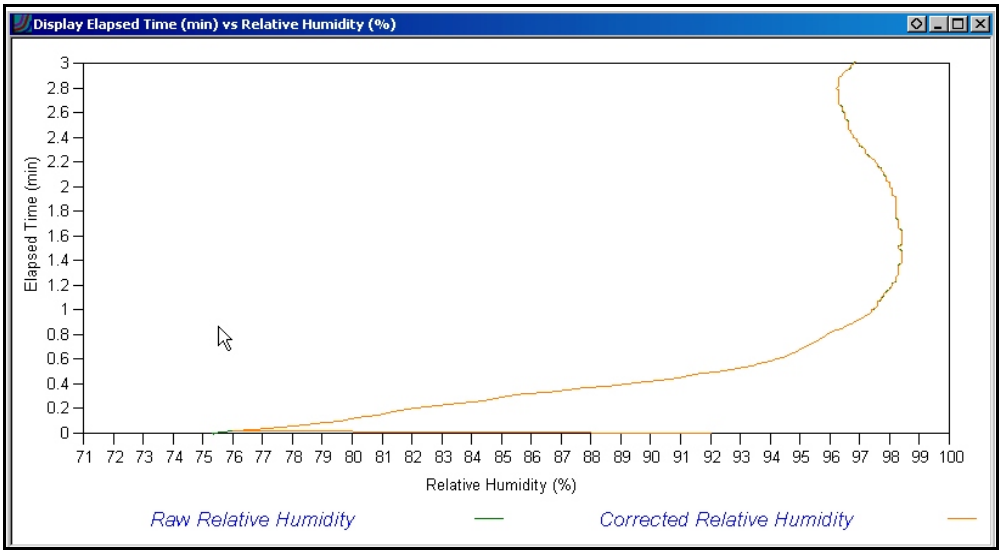
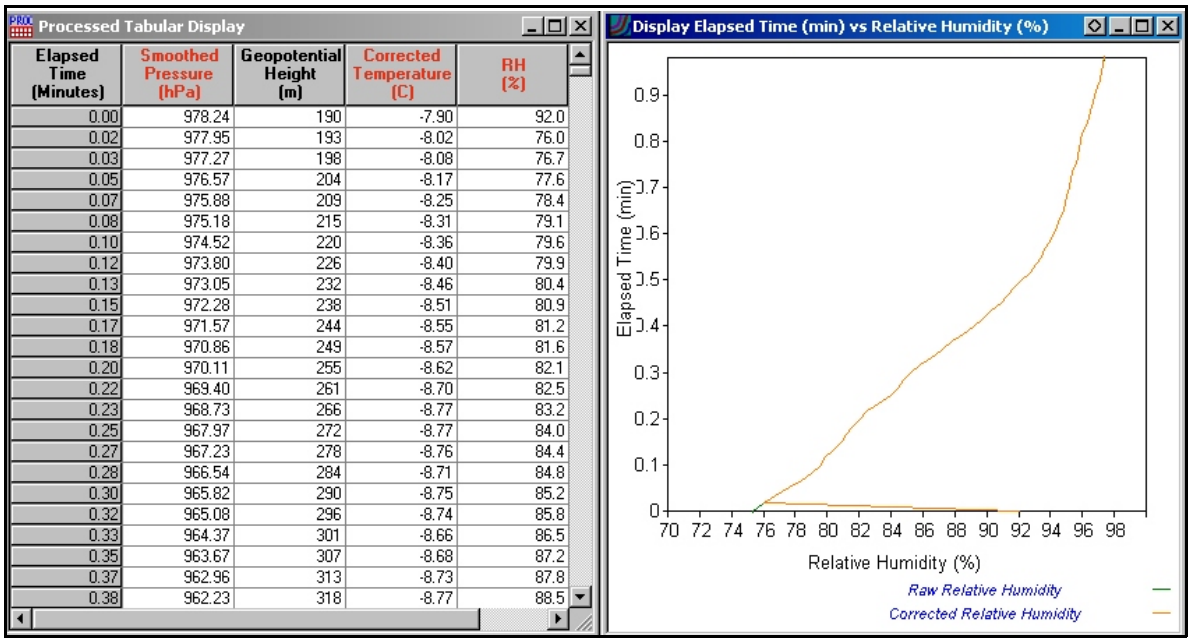


Exhibit 13-5A Relative Humidity Indicates Unrealistic Drying Immediately Off Surface

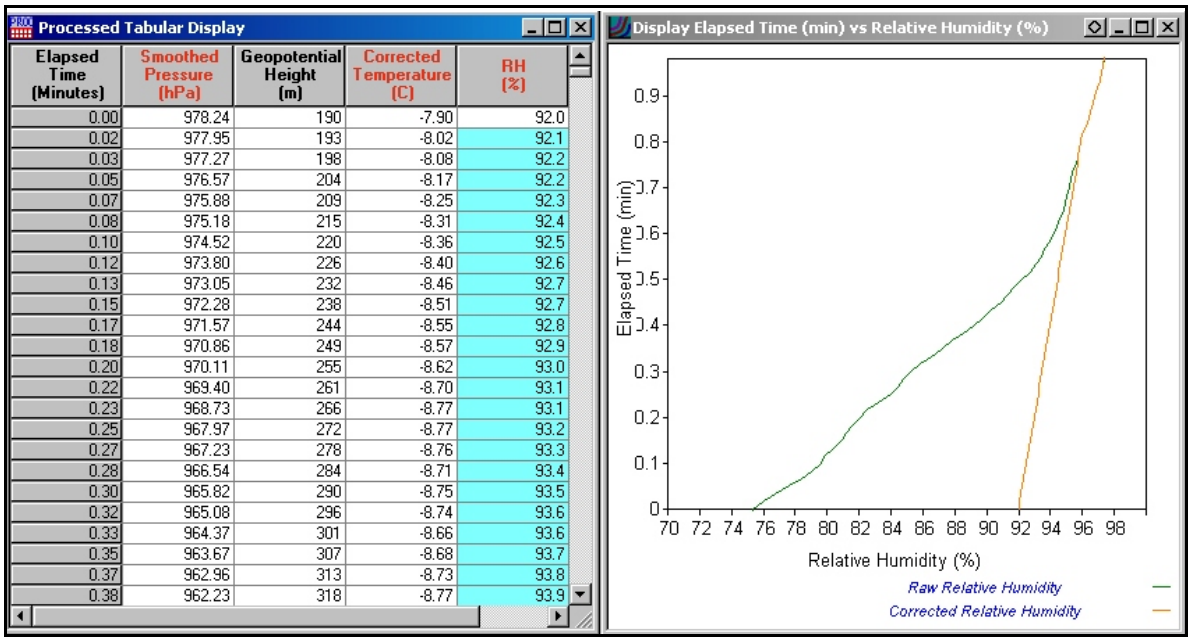
Go into the Processed Data and "Mark" by clicking the left mouse button and dragging from the first data point above surface until a more representative readings is reached. Then "Apply User Edits". (See Exhibit 13-5B **"Before Marking"** and Exhibit 13-5C **"After Marking"**)



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)
0.00	978.24	190	-7.90	92.0
0.02	977.95	193	-8.02	76.0
0.03	977.27	198	-8.08	76.7
0.05	976.57	204	-8.17	77.6
0.07	975.88	209	-8.25	78.4
0.08	975.18	215	-8.31	79.1
0.10	974.52	220	-8.36	79.6
0.12	973.80	226	-8.40	79.9
0.13	973.05	232	-8.46	80.4
0.15	972.28	238	-8.51	80.9
0.17	971.57	244	-8.55	81.2
0.18	970.86	249	-8.57	81.6
0.20	970.11	255	-8.62	82.1
0.22	969.40	261	-8.70	82.5
0.23	968.73	266	-8.77	83.2
0.25	967.97	272	-8.77	84.0
0.27	967.23	278	-8.76	84.4
0.28	966.54	284	-8.71	84.8
0.30	965.82	290	-8.75	85.2
0.32	965.08	296	-8.74	85.8
0.33	964.37	301	-8.66	86.5
0.35	963.67	307	-8.68	87.2
0.37	962.96	313	-8.73	87.8
0.38	962.23	318	-8.77	88.5

Exhibit 13-5B Processed Data and Relative Humidity Plot Before Marking Data

The Relative Humidity plot should indicate a more representative picture of the atmosphere. Notice the difference between the **"Raw Data"** and the **"Corrected Data"**. (See Exhibit 13-5C)



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)
0.00	978.24	190	-7.90	92.0
0.02	977.95	193	-8.02	92.1
0.03	977.27	198	-8.08	92.2
0.05	976.57	204	-8.17	92.2
0.07	975.88	209	-8.25	92.3
0.08	975.18	215	-8.31	92.4
0.10	974.52	220	-8.36	92.5
0.12	973.80	226	-8.40	92.6
0.13	973.05	232	-8.46	92.7
0.15	972.28	238	-8.51	92.7
0.17	971.57	244	-8.55	92.8
0.18	970.86	249	-8.57	92.9
0.20	970.11	255	-8.62	93.0
0.22	969.40	261	-8.70	93.1
0.23	968.73	266	-8.77	93.1
0.25	967.97	272	-8.77	93.2
0.27	967.23	278	-8.76	93.3
0.28	966.54	284	-8.71	93.4
0.30	965.82	290	-8.75	93.5
0.32	965.08	296	-8.74	93.6
0.33	964.37	301	-8.66	93.6
0.35	963.67	307	-8.68	93.7
0.37	962.96	313	-8.73	93.8
0.38	962.23	318	-8.77	93.9

Exhibit 13-5C Processed Data and Relative Humidity Plot After Marking Data

13.7 Relative Humidity Dry Bias and Environmental Conditions

The Sippican humidity sensor has been found to have a dry bias. The sensor has limitations, if the sensor is exposed to a moist cloud layer and then ascends into a cloud free area, and readings may be off by as much as 15%. This is a result of hysteris or a lag the sensor has in its ability to recover to actual conditions. In a non-changing or stable environment with temperatures warmer than -10 degrees Celsius, the relative humidity values normally are within 3 to 5%.

Also complicating this issue, are the occasions with extremely low relative humidity in lower portions of the atmosphere. (See Exhibit 13-6A and Exhibit 13-6B) Notice in exhibit 13-6A from around 850 to 400 hPa the relative humidity is less than 10% from the Chilled Mirror. The Chilled Mirror Humidity sensor readings are considered the standard for moisture accuracy. Finally, notice these soundings are from Wallops Island, VA. a coastal location.

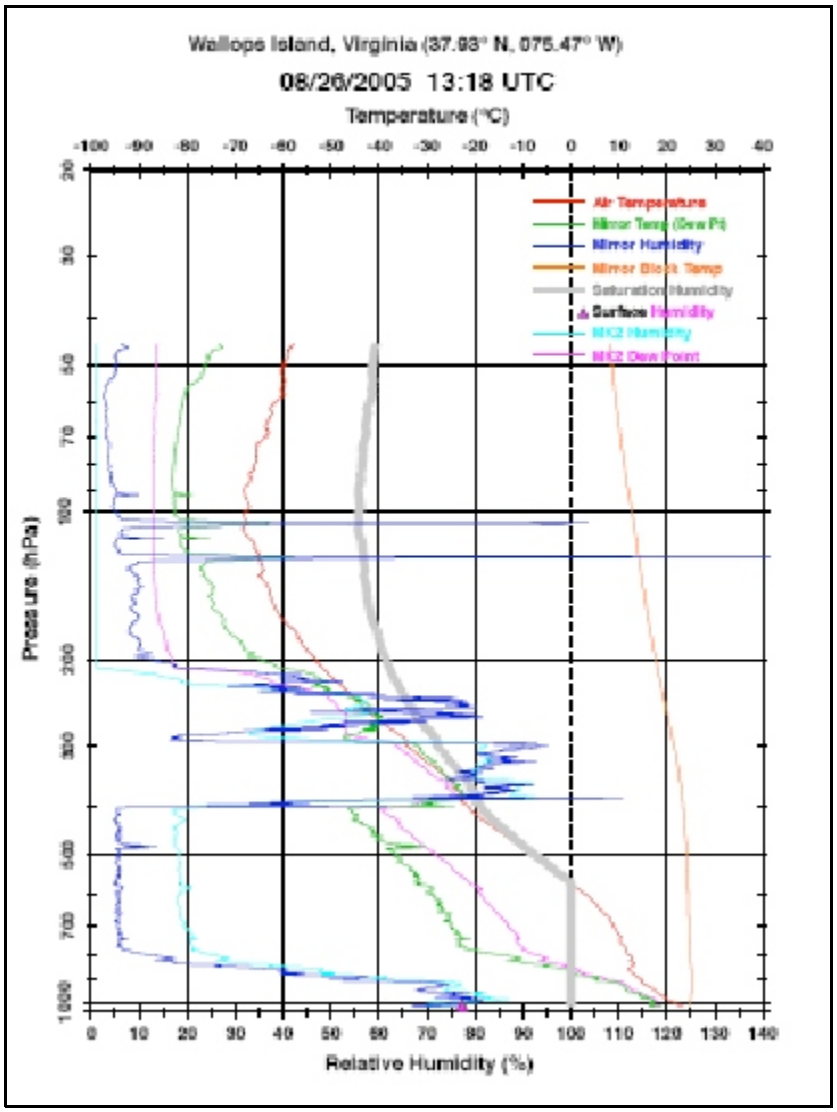


Exhibit 13-6A Relative Humidity Standard Indicates Extremely Dry Layers Near Surface

Exhibit 13-6B also provides another example of the chilled mirror indicating very dry conditions in the lower portions of a flight with some layers having relative humidity well below 10% .

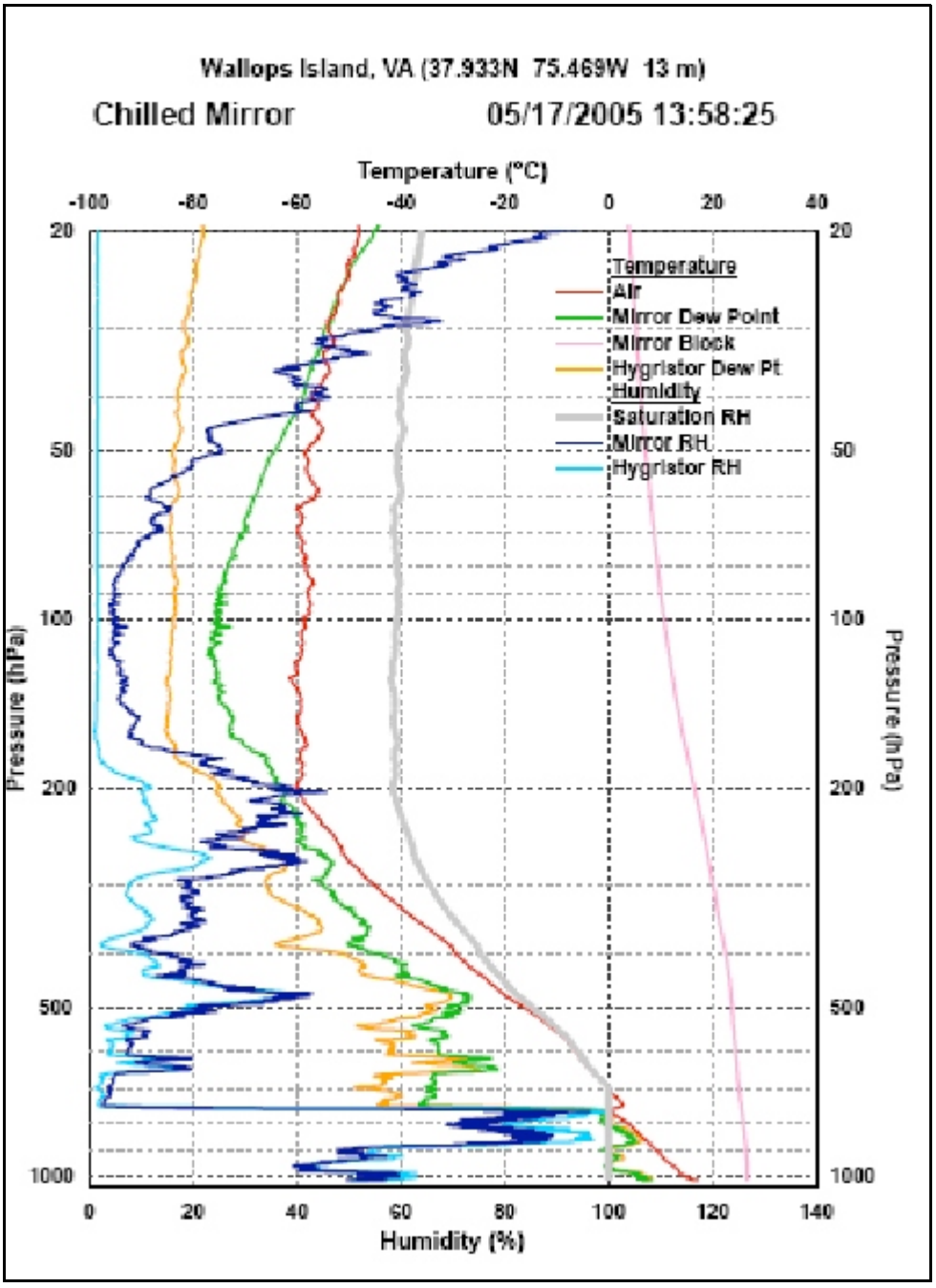


Exhibit 13-6B Chilled Mirror RH Readings Below 10%

The humidity sensor will indicate dry areas in the atmosphere that are known to be at times lower than the actual true conditions, but having readings with a 10% to 15% difference is typically a much better condition than making the data missing. (See Exhibit 13-7) Editing or deleting relative humidity data at temperatures warmer than -35 degrees Celsius should not attempted unless the observer is absolutely sure from other meteorological products that the data is invalid.

Above the tropopause, in the stratosphere, relative humidity values of greater than 10 to 15% are not likely in most cases except for thunderstorm penetration in the stratosphere. Deleting obviously moist RH profiles will not cause problems for the RRS software. The RRS software will use a default RH value of 20% for missing or deleted data. However, the coded messages will show missing dewpoint depressions that may trigger some errors in certain plot programs.

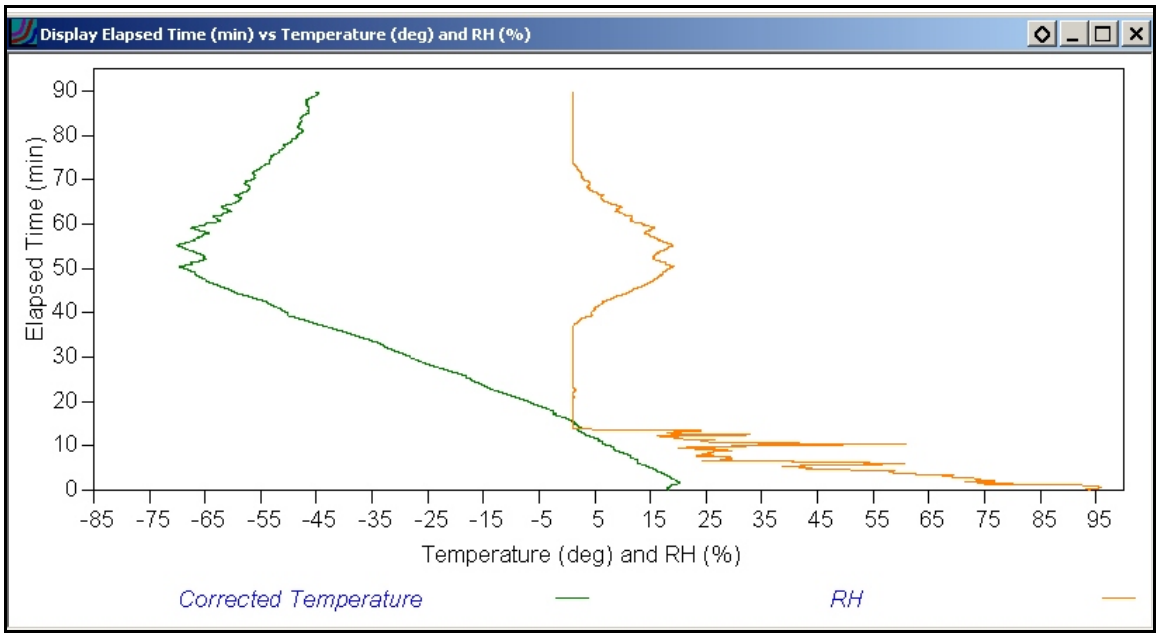


Exhibit 13-7 Dry Slots from 13 to 40 Minutes and Above 75 Minutes

NOTE: When the plot indicates dry slots be sure to validate the data with other products. If the data is definitely bad, delete it. Otherwise, do not edit.

13.8 Inaccurate Release Detection

The RRS software recognizes balloon release by detecting a decrease in pressure. There are certain conditions that may cause the release detection to be early or late. A few are:

Abrupt Change in Pressure	Change in Frequency
Radiosonde Failure	Equipment Failure

A change in pressure may cause the software to detect an early or late release. This may occur during transport to the inflation building. A change in frequency of only .2 MHz may cause the signal to be lost and release may not be detected. Radiosonde or equipment failure are also possible points of failure.

The key to minimizing this problem is:

1. **The operator must verify the frequency and sensor readings during baseline, after baseline, and prior to going to the inflation building**.

NOTE: The observer can not validate the sensor performance at the inflation building, but he/she can check the frequency, signal strength, and the operation of the equipment.

2. **It is critical that the frequency and signal strength be verified at the release point prior to and immediately after release.**

Exhibit 13-8A shows a flight where the release was not detected until 5 minutes after actual release. The surface pressure was 1005.7 hPa and at .33 minutes into the flight the received PTU shows a pressure of 843.9 hPa. The receiver shifted off frequency by only .4 MHz and lost signal. The operator noticed the problem and locked back on frequency. Once the receiver locked back on frequency, the release was detected. The first .3 minutes after release detection had missing "Raw" PTU data and the software interpolated the "Processed" data from surface to the first good data point. Interpolation occurred because less than 1-minute of missing data was recognized.

Processed Tabular Display

Elapsed Time (Minutes)	Time Stamp (UTC)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)
0.00	18:16:07	1005.71	190	-0.90	64.0
0.02	18:16:08	998.03	252	-1.10	61.7
0.03	18:16:09	989.50	320	-1.11	59.4
0.05	18:16:10	980.98	389	-1.12	57.2
0.07	18:16:11	972.50	458	-1.14	54.9
0.08	18:16:12	964.07	528	-1.15	52.6
0.10	18:16:13	955.80	596	-1.17	50.3
0.12	18:16:14	947.45	666	-1.18	48.0
0.13	18:16:15	939.18	736	-1.19	45.8
0.15	18:16:16	930.98	806	-1.21	43.5
0.17	18:16:17	922.85	876	-1.22	41.2
0.18	18:16:18	914.79	946	-1.23	38.9
0.20	18:16:19	906.81	1016	-1.25	36.6
0.22	18:16:20	898.89	1085	-1.26	34.4
0.23	18:16:21	891.04	1155	-1.27	32.1

Received PTU Tabular Display

Elapsed Time (min)	Time Stamp (UTC)	Raw Pressure (hPa)	Pressure QI	Raw Temp (C)
-0.00	18:16:06.714		0.00	
0.05	18:16:09.714		0.00	
0.10	18:16:12.714		0.00	
0.15	18:16:15.715		0.00	
0.20	18:16:18.714		0.00	
0.25	18:16:21.714		0.00	
0.30	18:16:24.714		0.00	
0.33	18:16:26.814	843.92	100.00	-1.14
0.35	18:16:27.714	843.63	100.00	-1.17
0.37	18:16:28.815	842.69	100.00	-1.21
0.38	18:16:29.814	842.52	100.00	-1.30
0.40	18:16:30.815	842.33	100.00	-1.31
0.42	18:16:31.815	841.65	100.00	-1.35
0.43	18:16:32.815	841.23	100.00	-1.34
0.45	18:16:33.814	840.65	100.00	-1.34

Exhibit 13-8A Processed and Raw Data for Flight with Late Release Detection

Exhibit 13-8B further illustrates the late release detection in the WMO Levels Table and the Pressure plot showing an abrupt change in pressure within the first .3 of a minute. Again, the shift in frequency prior to launch caused the release to go undetected.

In this example, the release was detected late, but no data was available because the receiver was off frequency at the true release time. The flight should be terminated because more than 3 consecutive minutes of data were missing.

NOTE: If a release is detected early and the data is available in the "Received PTU" Tabular Display, the observer would look at the 'Raw" data and find the point where the pressure shows a continual decrease.

WMO Levels Tabular Display

Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Corrected Temperature (C)	RH (%)	Geopotential Height (m)	Reason
0.00	1005.71	-0.90	64.0	190	SFC
0.01	1000.00	-1.05	62.3	236	STD P
0.03	991.40	-1.11	59.9	305	REG W
0.10	954.21	-1.17	49.9	610	REG W
0.16	925.00	-1.22	41.8	857	STD P
0.18	918.40	-1.23	39.9	914	REG W
0.25	883.92	-1.29	30.0	1219	REG W
0.33	854.91	-1.36	18.4	1485	RH
0.36	850.00	-1.41	18.5	1531	STD P
0.47	841.82	-1.53	18.5	1608	TEMP
1.33	818.69	-2.56	26.7	1829	REG W
1.77	806.16	-3.37	27.7	1951	TEMP
2.25	791.66	-3.18	26.3	2094	TEMP
2.38	787.74	-3.59	27.2	2134	REG W
3.32	760.66	-5.32	31.8	2409	TEMP
3.41	757.82	-5.37	32.4	2438	REG W

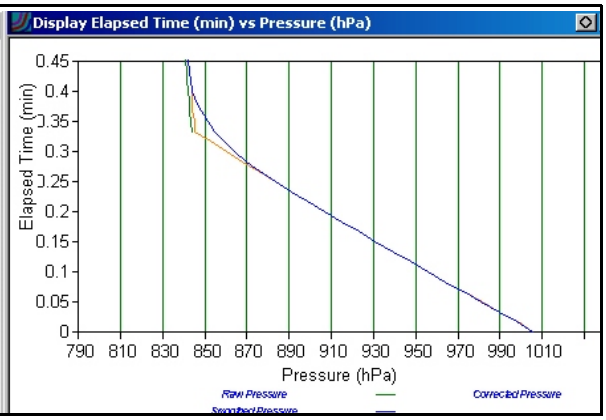


Exhibit 13-8B WMO Levels and Pressure Plot for Flight with Late Release Detection

13.9 Sensor Failure

Sensors may fail for various reasons from having defects to being damaged during a launch. The RRS software will terminate a flight once 3 consecutive minutes of missing temperature data is observed, but if data is received the flight will code the data received. This data may be totally unrealisitic. It is the observer's responsibility to use the tools provided to ensure the data is reasonable prior to transmitting the coded messages. Exhibit 13-9 illustrates a temperature sensor failure. The data received above surface shown in the Processed Data Tabular Display is well beyond possible environmental conditions. The Check Messages should be looked at for significant Temperature Lapse Rate changes over periods of time that exceed 1 minute in duration.

Again, it is important to remember that unless the operator "Marks" the Processsed Data, the coded message will be generated with the bad data. The software does not stop the coding process even when Check Messages are generated. The TTBB message in Exhibit 13-9 illustrates the software's inability to recognize unrealistic values. Notice, the first significant level above surface with a temperature of -98.3 degrees C.

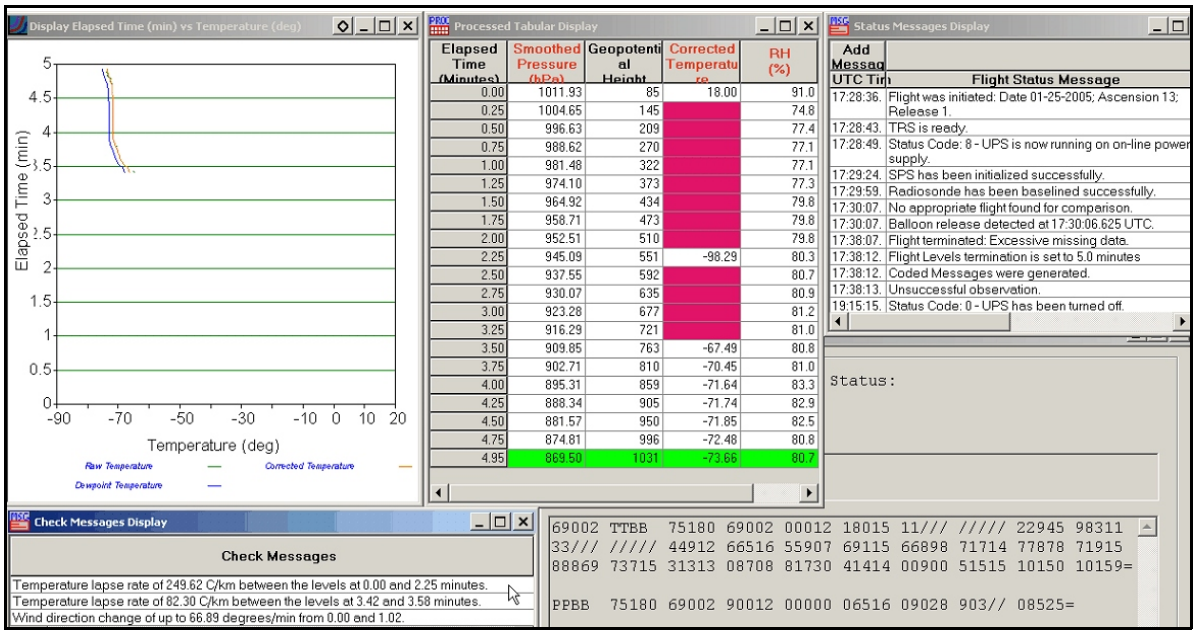
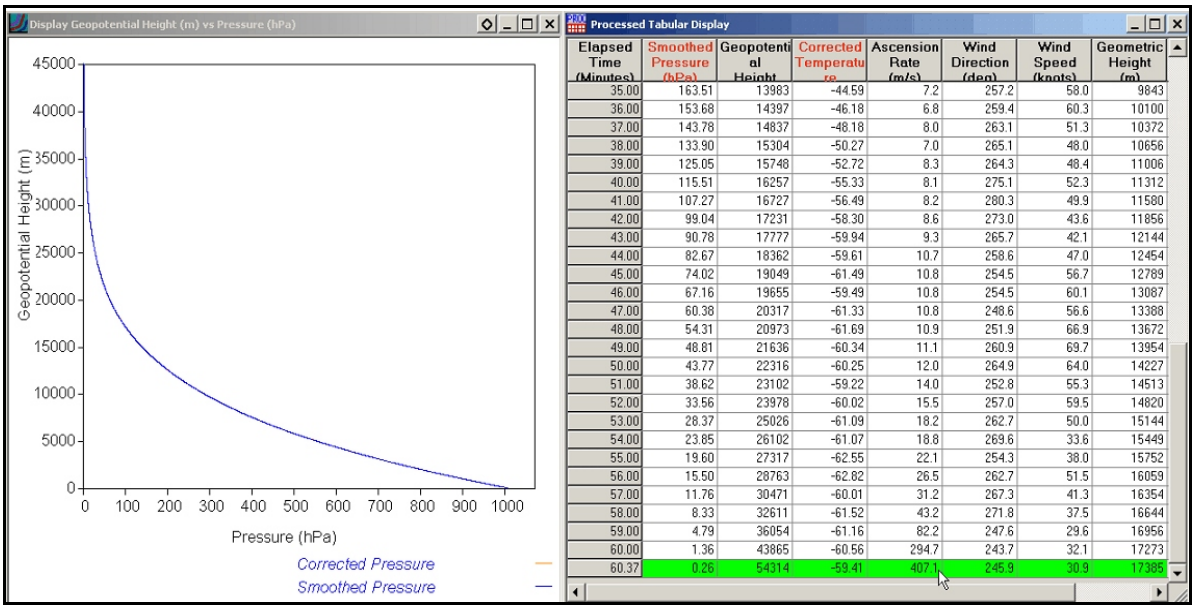


Exhibit 13-9 Temperature Sensor Failure Displays

The point is that even with modernization of the upper-air tracking system, radiosondes, and software capabilities the operator still has the responsibility to ensure his/her observation is accurate. The system can not detect all deficiencies.

13.10 Leaking Pressure Cell

Occasionally a pressure cell will begin to leak and begin to provide extremely high geopotential heights or much lower pressure values than normal. There are several items to confirm this situation exists and then to determine at what point the flight should be terminated. Exhibit 13-10 provides a look at the Processed Data Set and the Pressure Profile.



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height	Corrected Temperature	Ascension Rate (m/s)	Wind Direction (deg)	Wind Speed (knots)	Geometric Height (m)
35.00	163.51	13983	-44.59	7.2	257.2	58.0	9843
36.00	153.68	14397	-46.18	6.8	259.4	60.3	10100
37.00	143.78	14837	-48.18	8.0	263.1	51.3	10372
38.00	133.90	15304	-50.27	7.0	265.1	48.0	10656
39.00	125.05	15748	-52.72	8.3	264.3	48.4	11006
40.00	115.51	16257	-55.33	8.1	275.1	52.3	11312
41.00	107.27	16727	-56.49	8.2	280.3	49.9	11580
42.00	99.04	17231	-58.30	8.6	273.0	43.6	11856
43.00	90.78	17777	-59.94	9.3	265.7	42.1	12144
44.00	82.67	18362	-59.61	10.7	258.6	47.0	12454
45.00	74.02	19049	-61.49	10.8	254.5	56.7	12789
46.00	67.16	19655	-59.49	10.8	254.5	60.1	13087
47.00	60.38	20317	-61.33	10.8	248.6	56.6	13388
48.00	54.31	20973	-61.69	10.9	251.9	66.9	13672
49.00	48.81	21636	-60.34	11.1	260.9	69.7	13954
50.00	43.77	22316	-60.25	12.0	264.9	64.0	14227
51.00	38.62	23102	-59.22	14.0	252.8	55.3	14513
52.00	33.56	23978	-60.02	15.5	257.0	59.5	14820
53.00	28.37	25026	-61.09	18.2	262.7	50.0	15144
54.00	23.85	26102	-61.07	18.8	269.6	33.6	15449
55.00	19.60	27317	-62.55	22.1	254.3	38.0	15752
56.00	15.50	28763	-62.82	26.5	262.7	51.5	16059
57.00	11.76	30471	-60.01	31.2	267.3	41.3	16354
58.00	8.33	32611	-61.52	43.2	271.8	37.5	16644
59.00	4.79	36054	-61.16	82.2	247.6	29.6	16956
60.00	1.36	43865	-60.56	294.7	243.7	32.1	17273
60.37	0.26	54314	-59.41	407.1	245.9	30.9	17385

Exhibit 13-10 Leaking Pressure Cell Causing Unrealistic Height and Pressure Values

Some of the key signs of a Leaking Pressure Cell is very unrealistic Ascent Rates and Geopotential Height Values at termination. Notice the Processed Tabular Display indicates at 60.37 minutes elapsed time 54,314 geopotential meters. Remember, a typical flight may reach 30,000 meters or possibly as high as 33,000 meters any flights above 33,000 meters should be looked at closely.

A typical flight should ascend on average of 300 meters/minute or 5 meters per second. Looking in the ascent rate column that shows values of meters per second any values above 450 meters/minute or 8 meters per second for periods of a minute or more should be reviewed closely with the idea of terminated the flight prior to these unrealistic ascent rates.

13.11 Wetbulb Effect or Evaporative Cooling

It is not unusual for a sounding to show significant cooling of the temperature sensor after passing through a cloud or very moist parcel of air into a dry portion of the sounding. The temperature sensor if affected by evaporative cooling will indicate readings cooler than the actual atmospheric conditions. The operator should verify super-adiabatic lapse rates for this condition and mark through the data over a long enough period of time to smooth or interpolate the temperature readings. (See Exhibit 13-11A and Exhibit 13-11B)

Whenever the sounding indicates a moist layer with a significant dry layer above it, evaporative cooling may occur. If a super-adiabatic lapse is shown in the Check Messages during this period, ***the observer must take corrective action*** by marking the data. Notice in the example, at approximately 18 minutes in the flight, the RH went from near 70% to 15% in less than 30 seconds. Notice the temperature profile shows a distinct shift to the left towards colder temperatures as well during this time. Looking at the Temperature Lapse Rate column in the Processed Tabular Display is an xcellent tool to pinpoint the changes in the temperature data.

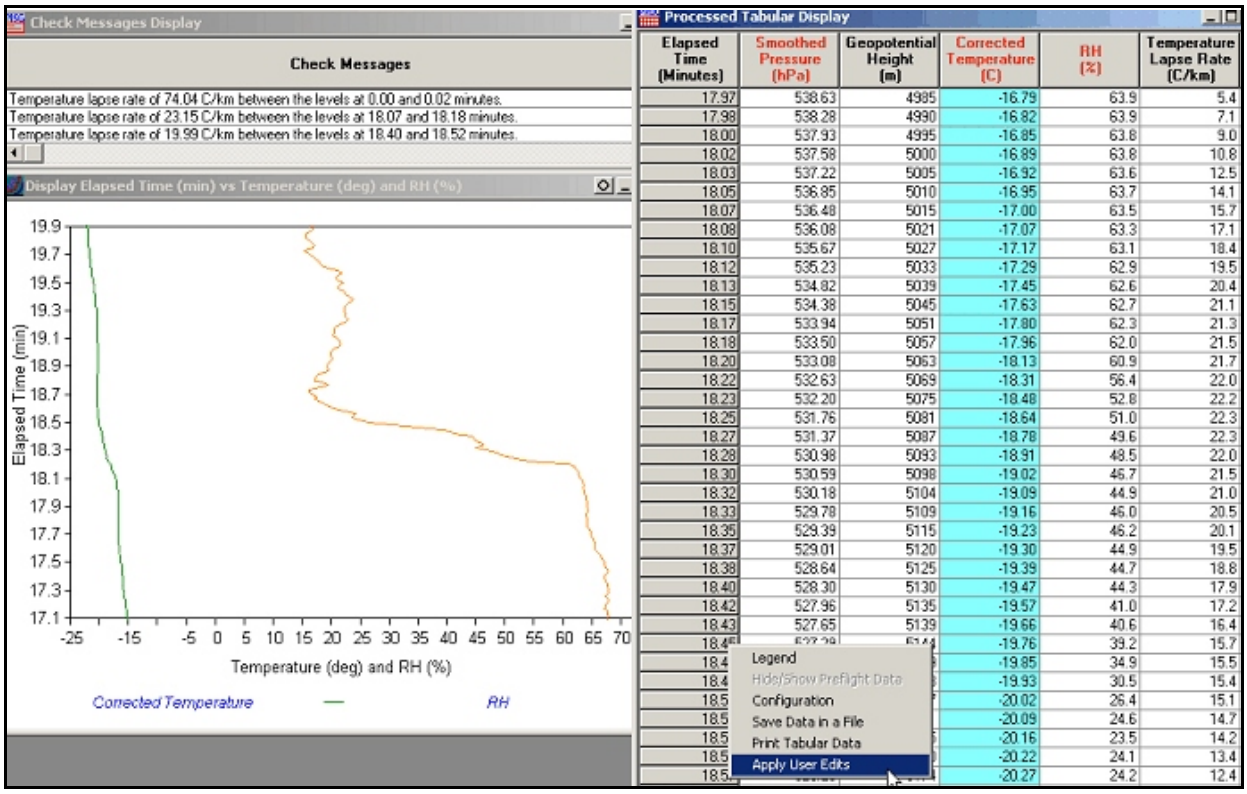
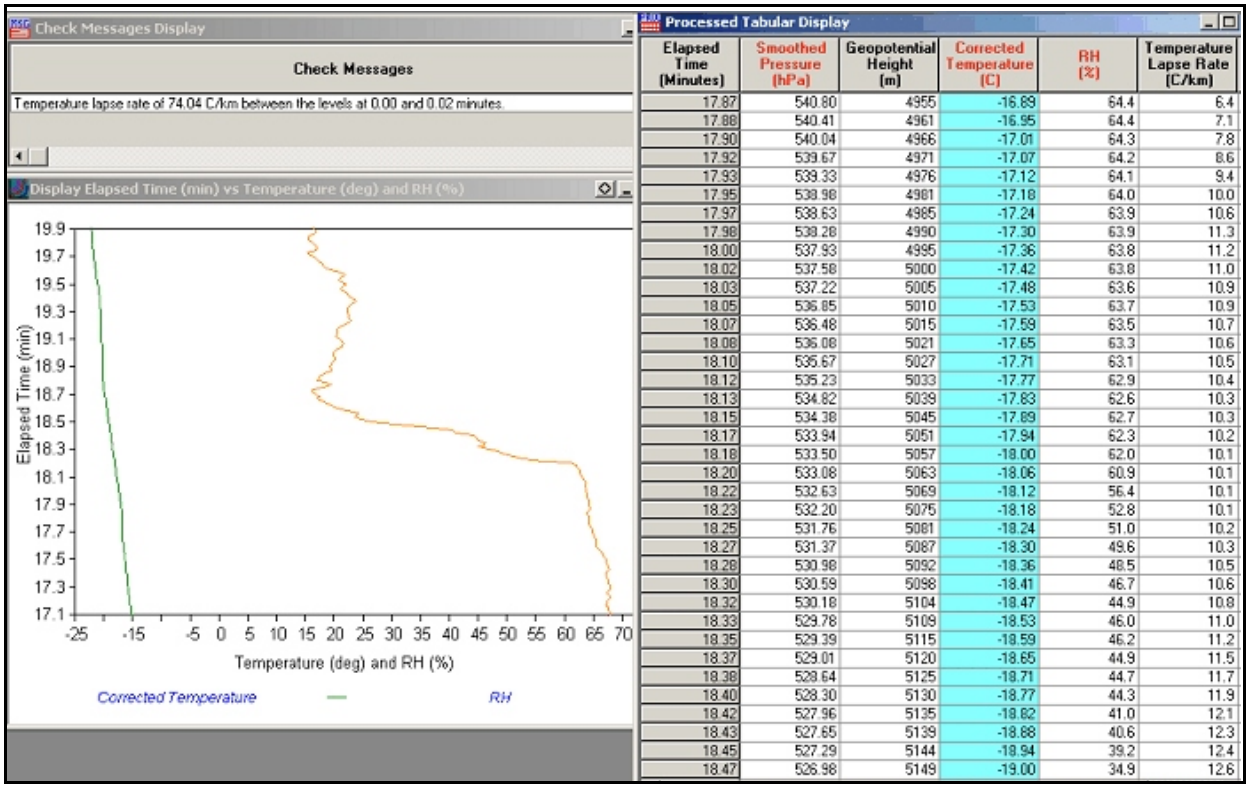


Exhibit 13-11A Wetbulb Effect or Evaporative Cooling Before Applying User Edits

NOTE: The flight data has been captured to show the original Check Messages, Temperature/RH Plot and Tabular Display with a portion of the Temperature Data selected for Marking.



Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)	RH (%)	Temperature Lapse Rate (C/km)
17.87	540.80	4955	-16.89	64.4	6.4
17.88	540.41	4961	-16.95	64.4	7.1
17.90	540.04	4966	-17.01	64.3	7.8
17.92	539.67	4971	-17.07	64.2	8.6
17.93	539.33	4976	-17.12	64.1	9.4
17.95	538.98	4981	-17.18	64.0	10.0
17.97	538.63	4985	-17.24	63.9	10.6
17.98	538.28	4990	-17.30	63.9	11.3
18.00	537.93	4995	-17.36	63.8	11.2
18.02	537.58	5000	-17.42	63.8	11.0
18.03	537.22	5005	-17.48	63.6	10.9
18.05	536.85	5010	-17.53	63.7	10.9
18.07	536.48	5015	-17.59	63.5	10.7
18.08	536.08	5021	-17.65	63.3	10.6
18.10	535.67	5027	-17.71	63.1	10.5
18.12	535.23	5033	-17.77	62.9	10.4
18.13	534.82	5039	-17.83	62.6	10.3
18.15	534.38	5045	-17.89	62.7	10.3
18.17	533.94	5051	-17.94	62.3	10.2
18.18	533.50	5057	-18.00	62.0	10.1
18.20	533.08	5063	-18.06	60.9	10.1
18.22	532.63	5069	-18.12	56.4	10.1
18.23	532.20	5075	-18.18	52.8	10.1
18.25	531.76	5081	-18.24	51.0	10.2
18.27	531.37	5087	-18.30	49.6	10.3
18.28	530.98	5092	-18.36	48.5	10.5
18.30	530.59	5098	-18.41	46.7	10.6
18.32	530.18	5104	-18.47	44.9	10.8
18.33	529.78	5109	-18.53	46.0	11.0
18.35	529.39	5115	-18.59	46.2	11.2
18.37	529.01	5120	-18.65	44.9	11.5
18.38	528.64	5125	-18.71	44.7	11.7
18.40	528.30	5130	-18.77	44.3	11.9
18.42	527.96	5135	-18.82	41.0	12.1
18.43	527.65	5139	-18.88	40.6	12.3
18.45	527.29	5144	-18.94	39.2	12.4
18.47	526.98	5149	-19.00	34.9	12.6

Exhibit 13-11B Wetbulb Effect Eliminated After Marking Temperature Data

NOTE: This Exhibit shows the changes made to the Check Messages and the Temperature Data in the Temperature/RH Plot after "Applying User Edits" to the Processed Tabular Data Display.

13.12 Evaluating Flight Termination Point

It is the observer's responsibility to ensure the correct termination point and reason is chosen. There are several key elements the observer should use to ensure this. The key elements include observing the Status Messages, looking at a zoomed in view of the Pressure and Temperature plots, and also the processed data set in around the termination point to ensure maximum height has been selected. (See Exhibits 13-12A to 13-12D)

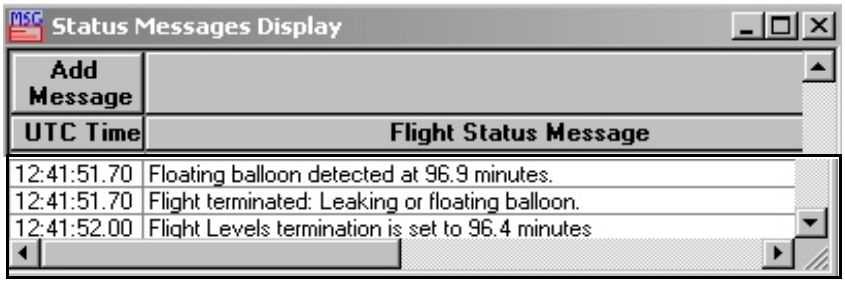


Exhibit 13-12A Flight Termination Status Messages

The Status Message indicates in this example three messages relating to the termination point and reason for termination . The observer must verify both the termination point and reason.

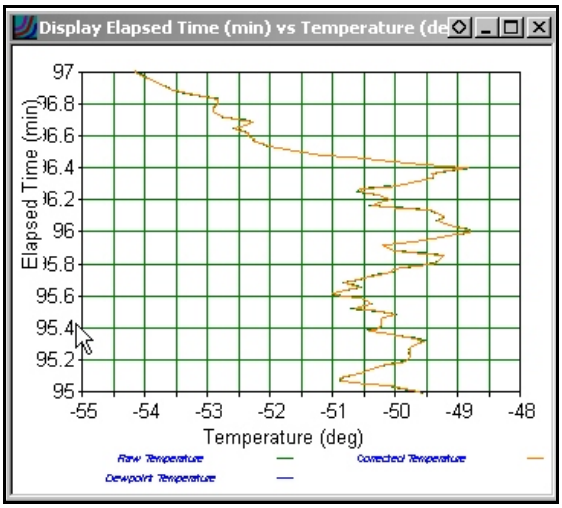


Exhibit 13-12B Expanded Temp Plot at Term

The temperature and pressure plot are always good starting points to verify the proper termination point and reason has been chosen. In Exhibit 13-12B notice the large temperature shift after 96.4 minutes.

The Pressure plot shows the termination point by an abrupt deviation from the trend. Note after 96.35 minutes the trend suddenly changes abruptly to the right indicating a sudden increase in the pressure. The point of change indicates Balloon Burst. (See Exhibit 13-12C)

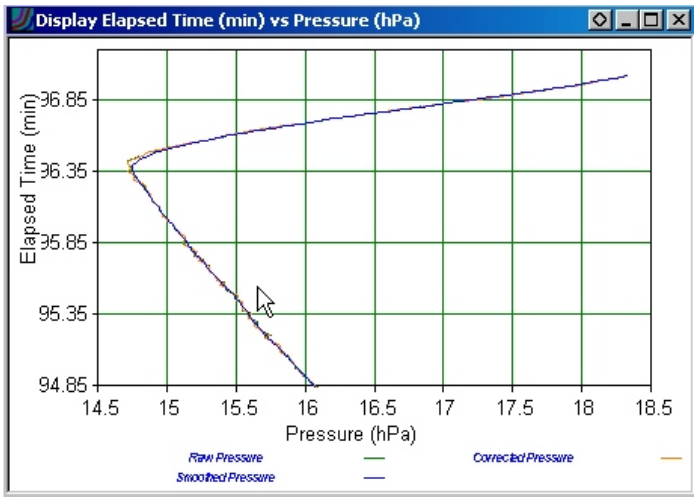


Exhibit 13-12C Expanded Pressure Plot at Term

Finally, the Processed Data Set may also be looked at to verify the proper point of termination by looking at the height values and ensuring the point of termination selected coincides with the highest height value. (See Exhibit 13-12D)

Processed Tabular Display

Elapsed Time (Minutes)	Smoothed Pressure (hPa)	Geopotential Height (m)	Corrected Temperature (C)
96.32	14.77	28355	-49.64
96.33	14.76	28361	-49.42
96.35	14.75	28364	-49.40
96.37	14.75	28365	-49.42
96.38	14.75	28363	-49.18
96.40	14.76	28359	-48.83
96.42	14.78	28351	-49.22

Exhibit 13-12D Processed Data with GPH Heights

13.13 Pressure Increase Since Baseline

It is extremely important that the surface observation be updated after release. The pressure can have a very significant effect on the data immediately above the surface. If the pressure rises by as little as .3 hPa or .01 inches and is not updated in the surface observation a significant super off surface will be indicated by a Check Message. The Pressure Plot will also show an unrepresentative deviation towards higher pressure. (See Exhibit 13-13)

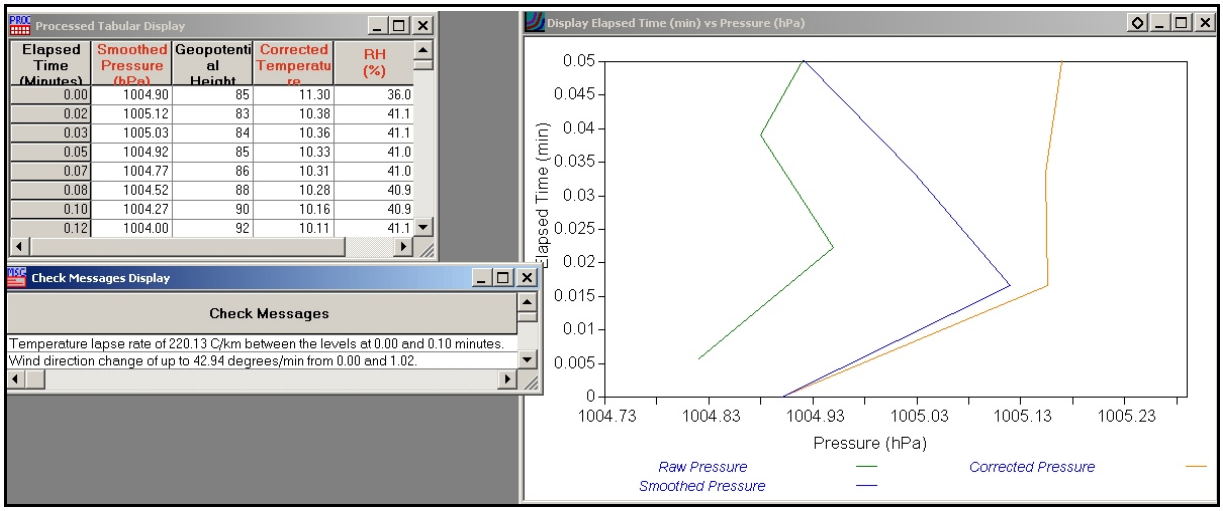


Exhibit 13-13 Pressure Increase Since Baseline Not Updated in Surface Observation

APPENDIX A - Abbreviations and Acronyms

This appendix includes abbreviations, acronyms, and contractions; they are defined in accordance with their usage in this handbook.

ABV . . . . . Mandatory and Significant Levels Above 100 hPa
AC . . . . . Air Conditioner
AFC . . . . . Automatic Frequency Control
AGL . . . . . Above Ground Level
AWIPS . . . . . Advanced Weather Interactive Processing System
AZ . . . . . Azimuth

BILS . . . . . Balloon Inflation Launch Shelter
BMD . . . . . Begin Missing Data
BX . . . . . Box

C . . . . . Centigrade
CCB . . . . . Configuration Control Board
CCW . . . . . Counter-Clockwise
CD . . . . . Compact Disk
CDU . . . . . Control Display Unit
cm . . . . . centimeters
CM . . . . . Change Management
CONUS . . . . . Conterminous United States
CPU . . . . . Central Processing Unit
CW . . . . . Clockwise

db . . . . . Decibels
DCE . . . . . Digital Communication Equipment
Deg . . . . . Degree
DOC . . . . . Department of Commerce

EA . . . . . Each
EL . . . . . Elevation
EHB . . . . . Engineering Handbook
EMD . . . . . End Missing Data
EMRS . . . . . Engineering Management and Reporting System
ESA . . . . . Electronic Systems Analyst
ET . . . . . Electronics Technician

FAA . . . . . Federal Aviation Administration
FMH-3 . . . . . Federal Meteorological Handbook, Number 3
ft . . . . . Feet
FTM . . . . . Free Text Message

FTP . . . . . File Transfer Protocol
FZL . . . . . Freezing Level
Gb . . . . . Gigabyte
GDL . . . . . Greatest Departure from Linearity
gm . . . . . Gram
GPS . . . . . Global Positioning System
hPa . . . . . Hecto Pascals
HPC . . . . . Hydrometeorological Prediction Center

ICAO . . . . . International Civil Aviation Organization
IF . . . . . Intermediate Frequency
IP . . . . . Internet Protocol
IR . . . . . Infrared Radiation

KHz . . . . . Kilohertz
km . . . . . Kilometer
Kb . . . . . Kilobyte
kt . . . . . Knot (nautical miles per hour)

LAN . . . . . Local Area Network
Lat . . . . . Latitude
LCD . . . . . Liquid Crystal Display
LCDU . . . . . Local Control Display Unit
LDAD . . . . . Local Data Acquisition and Dissemination
LED . . . . . Light Emitting Diode
LNA . . . . . Low Noise Amplifier
Long . . . . . Longitude
LORAN . . . . . Long Range Navigation (system)
LOS . . . . . Loss of Signal
LRU . . . . . Line Replaceable Unit

m . . . . . Meters
MAN . . . . . Mandatory Levels to 100 hPa
mb . . . . . Millibar
Mb . . . . . Megabyte
MCU . . . . . Motion Control Unit
MDO . . . . . Meteorological (Met) Data Oscillator
MET . . . . . Meteorological
MHz . . . . . Megahertz
MIC . . . . . Meteorologist-in-Charge
Min . . . . . Minute
mph . . . . . Miles Per Hour
MSL . . . . . Mean Sea Level

NAGS . . . . . Narrow Angle Gathering Sensor
NAVAID . . . . . Navigation Aid (implied usage of radio based system)

NCDC . . . . . National Climatic Data Center
NCEP . . . . . National Centers for Environmental Prediction, formerly NMC (e.g., AWC, HPC, MPC, SPC, and TPC)
NEC . . . . . National Electrical Code
NLSC . . . . . National Logistics Support Center
nmi . . . . . Nautical Mile (6076 feet)
NOAA . . . . . National Oceanic and Atmospheric Administration
NOTAM . . . . . Notice to Airman
NWS . . . . . National Weather Service
NWSTC . . . . . National Weather Service Training Center
NWSTG . . . . . National Weather Service Telecommunications Gateway

OAR . . . . . Office of Oceanic and Atmospheric Research
OBIT . . . . . Offline Built-In Test
OCCWS . . . . . Office of Climate Water and Weather Services
OFCM . . . . . Office of the Federal Coordinator for Meteorology
OMS . . . . . Offline Maintenance Suite
OOS . . . . . Office of Operational Services
OPS . . . . . Office of Program Services
OQC . . . . . Operational Quality Control
OS . . . . . Observing Services
OS . . . . . Operating System
OST . . . . . Office of Systems Technology

PCM . . . . . Pulse Code Modulation
PDB . . . . . Precision Digital Barometer
PSA . . . . . Power Supply Assembly
PSI . . . . . Pounds Per Square Inch
PTU . . . . . Pressure, Temperature, Humidity

QC . . . . . Quality Control

R/ACU . . . . . Receiver - Antenna Control Unit
RADAT . . . . . Freezing Level Data
RCDU . . . . . Remote Control Display Unit
RDF . . . . . Radio Direction Finding
RF . . . . . Radio Frequency
RH . . . . . Relative Humidity
RMS . . . . . Root Mean Square
RRS . . . . . Radiosonde Replacement System
RSMC . . . . . Regional Specialized Meteorological Centers
RSOIS . . . . . Radiosonde Surface Observing Instrumentation System
RWS . . . . . Radiosonde Replacement System Workstation

SCA . . . . . System Communication System

SCSI . . . . . Small Computer Systems Interface

Sec . . . . . Second
SGL . . . . . Significant Levels to 100 hPa
SID . . . . . Station Identifier
SIG . . . . . Significant Levels to 100 hPa
SIM . . . . . System Integration Manager
Sonde . . . . . Radiosonde
SOO . . . . . Science and Operations Officer
SPC . . . . . Storm Prediction Center
SPS . . . . . Signal Processing System

T-1 . . . . . Connection capable of 1.544 million bits per second
TPC . . . . . Tropical Prediction Center (National Hurricane Center)
TPMS . . . . . Transition Power Maintenance System
TRS . . . . . Telemetry Receiver System

UHF . . . . . Ultra High Frequency (radio)
UPS . . . . . Uninterruptible Power Supply
USB . . . . . Universal Serial Bus
UTC . . . . . Universal Time Coordinated

VAD . . . . . Velocity Azimuth Display

WAGS . . . . . Wide Angle Gathering Sensor
WBAN . . . . . Weather Bureau Army Navy
WBRT . . . . . Weather Bureau Radio Theodolite
WCM . . . . . Warning Coordination Meteorologist
WFO . . . . . Weather Forecast Office
WMO . . . . . World Meteorological Organization
WS . . . . . Weather Service
WSH . . . . . Weather Service Headquarters
WSOH-10 . . . . . Weather Service Observing Handbook, Number 10
WSOM . . . . . Weather Service Operations Manual
WWW . . . . . World Weather Watch
WWW . . . . . World Wide Web

Appendix B. Clouds/WX Codes

B.1 Introduction

This appendix provides the necessary tables and specific instructions to enter Clouds/Wx at the Surface Data screen. This guidance assumes no previous knowledge of synoptic code procedures. However, a basic understanding of clouds and weather is necessary.

For those already familiar with synoptic code, you will notice some departure from conventional WMO coding procedures. If you simply observe the elements requested and report them according to tables provided in this text, the intent of the Clouds/Wx entry will be fully met.

B.2 Getting Started

The Cloud/WX entry is a nine-digit, mandatory group. **All** nine digits must be entered, regardless of the presence **or** absence of clouds or significant weather conditions.

Operational Suggestion: If time before release is critical to where a proper Clouds/Wx coding cannot be made, simply enter any nine digits to complete the Surface Data screen. After release, properly code the clouds and weather. Edit the surface observation by clicking on "Tools" and selecting "Change Surface Data" enter the Clouds/Wx block with new data.

The WMO format for entry of clouds and weather has been modified in the RRS software to meet NCDC requirements. **All** stations using RRS software will follow this modified format, regardless of location; i.e., stations in either WMO Region IV or WMO Region V. A description of the nine-digit format follows:

1. Clouds/Wx group format: $\mathbf{N_hC_LhC_MC_HWWWW}$

   a. $\mathbf{N_h}$ = Amount (in oktas) of the sky covered by all low clouds ($\mathbf{C_L}$) observed or the amount of sky covered by all the middle clouds ($\mathbf{C_M}$) observed. In no case will the amounts of the low and middle clouds be combined to report $\mathbf{N_h}$. Use **Table B-1** to report the amount of low or middle cloud coverage.

   b. $\mathbf{C_L}$ = Type of low cloud, based on the priority given in **Table B-2**. A solidus (/) is reported if $\mathbf{C_L}$ clouds are not visible owing to fog or similar obscuring phenomena.

   Note: Clouds are divided into three families, classified as low, middle, or high. The general height ranges for these are: surface to 6500 feet for low; 6500 feet to 20000 feet for middle; and above 20000 feet for high. Remember, these ranges are not absolute, but given as a guide only. More consideration may be given to the cloud form than the height in many cases. Each cloud family is coded with a single digit, 0 through 9. The code figure 0 is used to indicate that clouds are not present for a given family.

c. **h** = Height of the base of the lowest cloud observed. The height reported is with respect to the surface. The height is coded as a solidus (/) if there is a total surface-based obscuration that prevents an observation of the clouds. Use **Table B-3** for the cloud base height.

d. $\mathbf{C_M}$ = Type of middle cloud, based on priority given in **Table B-4**. A solidus (/) is reported if $\mathbf{C_M}$ clouds are not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

e. $\mathbf{C_H}$ = Type of high cloud, based on priority given in **Table B-5**. A solidus (/) is reported if $\mathbf{C_H}$ clouds are not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

f. **WWWW** = Present weather coded in two groups of **WW**. These code groups are found in **Table B-6**. The coding starts with 99 (the highest priority) and descends to 00 (the lowest priority). Note that code figure 17 is placed out of numerical sequence to highlight its relative coding priority. You should note that present weather codes for some weather phenomena are events that have occurred during the past hour, not at observation time. When entering **WWWW**, go down **Table B-6** and use the first and second applicable code figures. Note that two **WW** groups must **always** be coded, even if that means using the same code figure twice.

(See the Example Observations page at the end of Appendix B.)

Table B-1. Amount of Low/Middle Cloud, N_h

Code figure	Cloud amount in oktas (eights)	Cloud amount in tenths
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10 - 3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10 - 8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Sky obscured by fog and/or other meteorological phenomena	
/	Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made	

Note: If there are any breaks in the sky at all, such as an overcast with a mackerel sky (altocumulus perlucidus or stratocumulus perlucidus), $\mathbf{N_h}$ would be encoded as 7. If there are only a few patches of low or middle cloud in the sky, $\mathbf{N_h}$ cannot be encoded as 0 but is encoded as 1. A partial obscuration does not affect the coding of $\mathbf{N_h}$. A total obscuration is coded as 9, not 8 (overcast sky).

Table B-2. Coding of Low Cloud, C_L

This table presents the specifications for type of low cloud, $\mathbf{C_L}$, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
	(a) Cumulonimbus present, with or without other C_L clouds
C_L = 9	If the upper part of at least one of the cumulonimbus clouds present is clearly fibrous or striated, use **C_L = 9.**
C_L = 3	If the upper part of none of the cumulonimbus clouds present is clearly fibrous or striated, use **C_L = 3.**
	(b) No cumulonimbus present
C_L = 4	If stratocumulus formed by the spreading out of cumulus is present, use **C_L = 4.**
C_L = 8	If the **C_L** code figure 4 is not applicable and if cumulus and stratocumulus clouds with bases at different levels are present, use **C_L = 8.**
C_L = 2	If the **C_L** code figures 4 and 8 are not applicable and if cumulus clouds of moderate or strong vertical extent are present, use **C_L = 2.**

(Table B-2 continues next page)

Table B-2. Coding of Low Cloud, C_L (Continued)

Code Figure	Coding criteria
C_L = 1	If the **C_L** code figures 4, 8, and 2 are not applicable: use **C_L = 1,** if the **C_L** clouds present are predominantly[1] cumulus with little vertical extent and seemingly flattened or ragged cumulus other than of bad weather[2], or both;
C_L = 5	Use **C_L = 5,** if among the **C_L** clouds present, stratocumulus other than that formed by the spreading out of cumulus is predominant;
C_L = 6	Use **C_L = 6,** if the **C_L** clouds present are predominantly stratus in a more or less continuous sheet or layer, or in ragged shreds (other than ragged stratus of bad weather), or both;
C_L = 7	Use **C_L = 7,** if the **C_L** clouds present are predominantly pannus (ragged shreds of stratus of bad weather or ragged cumulus of bad weather), or both.
0	No **C_L** Clouds -- No cumulus, cumulonimbus, stratocumulus, or stratus.
/	**C_L** clouds not visible owing to fog or similar obscuring phenomena.

[1]Consideration of predominance is restricted to the clouds corresponding to **C_L** code figures 1, 5, 6 and 7, which have the same priority. Clouds of any one of these four specifications are said to be predominant when their sky cover is greater than that of the clouds of any of the other three specifications.

[2]'Bad weather' denotes the conditions which generally exist during precipitation and a short time before and after.

Table B-3. Height of Cloud Base Above Ground, h

Code figure	Reportable heights(ft)
0	0 or 100
1	200 or 300
2	400 to 600*
3	700 to 900*
4	1000 to 1900*
5	2000 to 3200*
6	3300 to 4900*
7	5000 to 6500**
8	7000 to 8000**
9	8500 or higher or no clouds
/	unknown or base of clouds below surface of station

* reported in 100 foot increments
** reported in 500 foot increments

Note: This group is used to report the height of the base of the lowest cloud seen, regardless of cloud amount. The height reported is with respect to the surface.

The lowest cloud height is coded with a solidus (/) if there is a total surface-based obscuration that prevents an observation of the clouds.

Table B-4. Coding of Middle Cloud, C_M

This table presents the specifications for type of middle cloud, $\mathbf{C_M}$, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
	(a) Altocumulus present
C_M = 9	If the sky is chaotic, use **C_M = 9.**
C_M = 8	If the **C_M** code figure 9 is not applicable and if altocumulus with sprouting in the form of turrets or battlements or altocumulus having the appearance of small cumuliform tufts is present, use **C_M = 8.**
C_M = 7	If the **C_M** code figures 9 and 8 are not applicable and if altostratus or nimbostratus is present together with altocumulus, use **C_M = 7.**
C_M = 6	If the **C_M** code figures 9, 8, and 7 are not applicable and if altocumulus formed by the spreading out of cumulus or cumulonimbus is present, use **C_M = 6.**
C_M = 5	If the **C_M** code figures 9, 8, 7, and 6 are not applicable, and if the altocumulus present is progressively invading the sky, use **C_M** = 5.

*****There are several definitions of **C_M = 7** and each has a different priority; therefore **C_M = 7** appears several times in this code table.

(Table B-4 continues next page)

Table B-4. Coding of Middle Cloud, C_M (Continued)

Code figure	Coding criteria
C_M = 4	If the **C_M** code figures 9, 8, 7, 6, and 5 are not applicable and if the altocumulus present is continually changing in appearance, use **C_M = 4.**
C_M = 7	If the **C_M** code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at two or more levels, use **C_M = 7.**
C_M = 7, 3	If the **C_M** code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at one level, use **C_M = 7** or **3** depending on whether the greater part of the altocumulus is respectively opaque or semi-transparent.
	(b) No altocumulus present
C_M = 2	If nimbostratus is present or if the greater part of the altostratus present is opaque, use **C_M = 2.**
C_M = 1	If there is no nimbostratus and if the greater part of the altostratus present is semi-transparent, use **C_M = 1.**
0	No **C_M** Clouds -- No altocumulus, altostratus, or nimbostratus.
/	**C_M** clouds not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

Table B-5. Coding of High Cloud, C_H

This table presents the specifications for type of high cloud, $\mathbf{C_H}$, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
C_H = 9	If cirrocumulus is present alone or is more than the combined sky cover of any cirrus and cirrostratus present, use **C_H = 9.**
	(a) Cirrostratus present
C_H = 7	If the cirrostratus covers the whole sky, use **C_H = 7.**
C_H = 8	If the cirrostratus does not cover the whole sky and is not invading the celestial dome, use **C_H = 8.**
C_H = 6	If the cirrostratus is progressively invading the sky and if the continuous veil extends more than 45 degrees above the horizon but does not cover the whole sky, use **C_H = 6.**
C_H = 5	If the cirrostratus is progressively invading the sky but the continuous veil does not reach 45 degrees above the horizon, use **C_H = 5.**

(Table B-5 continues next page)

Table B-5. Coding of High Cloud, C_H (Continued)

Code figure	Coding criteria
	(b) C_H = 9 not applicable and no cirrostratus present
C_H = 4	If the cirrus clouds are invading the sky, use **C_H = 4.**
C_H = 3	If the **C_H** code figure 4 is not applicable and if dense cirrus which originated from cumulonimbus is present in the sky, use **C_H = 3.**
C_H = 2, 1	If the **C_H** code figures 4 and 3 are not applicable: Use **C_H = 2,** if the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts is greater than the combined sky cover of cirrus in the form of filaments, strands or hooks; Use **C_H = 1,** if the combined sky cover of cirrus in the form of filaments, strands or hooks is greater than the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts.
0	No **C_H** Clouds -- No cirrus, cirrostratus, or cirrocumulus.
/	**C_H** clouds not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

Table B-6. Coding of Present Weather, WW

This table presents the specifications for present weather, **WW**, in order of priority. Go down the table and use the first and second applicable code figures. The code figure with the higher priority is reported as the first **WW** group and the code with the lower priority is the second **WW** group. (This convention is followed even if the higher priority code decribes weather that occurred during the preceding hour but not at the time of observation.) Note that two **WW** groups must **always** be coded, even if that means using the same code figure twice. (See the Example Observations page at the end of Appendix B.)

ww = 99-50	Used for precipitation at the station at the time of observation.
ww = 99-80	Used for showery precipitation or precipitation with current or recent thunderstorms.

99 Thunderstorm, severe, with hail, small hail, or snow pellets at time of observation.

There may or may not also be rain or snow or a mixture of rain and snow of any intensity.

98 Thunderstorm at time of observation combined with duststorm at time of observation.

There must also be some sort of precipitation at the time of observation, but it may not be seen because of poor visibility. Judgment must be used.

97 Thunderstorm, severe without hail, small hail, or snow pellets but with rain and/or snow at time of observation.

The rain or snow may be of any intensity.

96 Thunderstorm with hail, small hail, or snow pellets at time of observation.

There may or may not be rain or snow or a mixture of rain and snow of any intensity.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

95 Thunderstorm without hail, small hail, or snow pellets, but with rain and/or snow at time of observation.

ww = 94-91	Used if there was a thunderstorm during the past hour, and there is some sort of precipitation at the time of observation. In order to have this situation, the last lightning or thunder observed must have been more than 15 minutes before the observation, but less than 1 hour 15 minutes before the observation.

94 Moderate or heavy snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.

93 Light snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.

92 Moderate or heavy rain at time of observation. Thunderstorm during previous hour but not at time of observation.

No other forms of precipitation.

91 Light rain at time of observation. Thunderstorm during previous hour but not at time of observation.

No other forms of precipitation.

ww = 90-80	Used to report showery precipitation that is not associated with a thunderstorm. Showers fall from cumuliform clouds that are, by nature, isolated. Because of this, individual showers do not last very long. Code figure 89 is not reported under United States rules.

90 Moderate or heavy shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

ww = 88-87	Used if showers of snow pellets or ice pellets are observed at the station at the time of the observation. The snow pellets or ice pellets may or may not be mixed with rain or both rain and snow

88 Moderate or heavy shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed.

All of the precipitation must be moderate or heavy.

87 Light shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed.

All of the precipitation must be light.

ww = 86-85	Used if only snow showers are observed at the station at the time of observation.

86 Snow shower(s), moderate or heavy.

85 Snow shower(s), light.

ww = 84-83. Used if mixed rain showers and snow showers are observed at the station at the time of observation.

84 Moderate or heavy shower(s) of rain and snow mixed. Intensity of either may be moderate or heavy.

83 Light shower(s) of rain and snow mixed. Intensity of both must be light.

ww = 82-80. Used to report rain showers at the time of observation.

82 Violent rain shower(s).

Report a rain shower as violent if the rate of fall is at least 1.0" per hour or 0.10" in 6 minutes.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

81 Moderate or heavy rain shower(s).

80 Light rain shower(s).

ww = 79-50	Use code figures 79-50 for precipitation that is not showery.
ww = 79-70	Use code figures 79-70 to report solid precipitation not in showers.
ww = 79-76	Use code figures 79-76 to report types of solid, non-showery precipitation.

79 Ice Pellets.

Use this code figure regardless of the intensity of the ice pellets and regardless of whether the ice pellets are mixed with another type of precipitation.

78 Isolated star-like snow crystals with or without fog or ice fog.

77 Snow grains with or without fog or ice fog.

Use this code figure regardless of intensity.

76 Diamond dust (ice crystals) with or without fog or ice fog.

ww = 75-70	Use code figures 75-70 to report snow that is not in the form of showers at the station at the time of the observation. The code figure selected depends on a combination of intensity and whether the snow is intermittent or continuous.

75 Continuous fall of snowflakes, heavy at time of observation.

74 Intermittent fall of snowflakes, heavy at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

73 Continuous fall of snowflakes, moderate at time of observation.

72 Intermittent fall of snowflakes, moderate at time of observation.

71 Continuous fall of snowflakes, light at time of observation.

70 Intermittent fall of snowflakes, light at time of observation.

ww = 69-60	Code figures 69-60 are generally used to report rain.
ww = 69-66	Use code figures 69-66 to report liquid precipitation that is mixed with snow or is freezing.

69 Rain or drizzle and snow, moderate or heavy.

68 Rain or drizzle and snow, light.

67 Rain, freezing, moderate or heavy.

66 Rain, freezing, light.

ww = 65-60	Use code figures 65-60 to report rain (but not freezing rain or rain mixed with snow) at the station at the time of observation. The code figure used depends on the combination of intensity and whether the precipitation is intermittent or continuous.

65 Rain, not freezing, continuous, heavy at time of observation.

64 Rain, not freezing, intermittent, heavy at time of observation.

63 Rain, not freezing, continuous, moderate at time of observation.

62 Rain, not freezing, intermittent, moderate at time of observation.

61 Rain, not freezing, continuous, light at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

60 Rain, not freezing, intermittent, light at time of observation.

ww = 59-50	Use 59-50 to report drizzle.
ww = 59-56	Drizzle mixed with rain, or freezing drizzle.

59 Drizzle and rain, moderate or heavy.

58 Drizzle and rain, light.

57 Drizzle, freezing, moderate or heavy.

56 Drizzle, freezing, light.

ww = 55-50	Use code figures 55-50 to report drizzle (but not freezing drizzle or drizzle mixed with rain) at the station at the time of observation.

55 Drizzle, not freezing, continuous, heavy at time of observation.

54 Drizzle, not freezing, intermittent, heavy at time of observation.

53 Drizzle, not freezing, continuous, moderate at time of observation.

52 Drizzle, not freezing, intermittent, moderate at time of observation.

51 Drizzle, not freezing, continuous, light at time of observation.

50 Drizzle, not freezing, intermittent, light at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

ww = 49-00	Use code figure 49-00 when no precipitation is occurring at the station at the time of observation.
ww = 49-40	Use code figures 49-40 only if there is fog. The fog may be made of water droplets or ice crystals (ice fog). The visibility in fog or ice fog must be less than 5/8 mi. If the visibility is 5/8 mi or more, use code figure 10. The code figure used will depend on whether the fog has changed during the past hour and whether the sky can be seen (blue sky, stars or higher clouds).

49 Fog depositing rime, sky invisible.

Fog that deposits rime will be made up mostly of supercooled water droplets, not ice crystals.

48 Fog, depositing rime, sky visible.

47 Fog or ice fog, sky invisible. Fog has begun or has become thicker during the preceding hour.

46 Fog or ice fog, sky visible. Fog has begun or has become thicker during the preceding hour.

45 Fog or ice fog, sky invisible. Fog has shown no appreciable change during the preceding hour.

44 Fog or ice fog, sky visible. Fog has shown no appreciable change during the preceding hour.

(Table B-6 continues on next page)

Table B-6. Coding of Present Weather, WW (Continued)

43 Fog or ice fog, sky invisible. Fog has become thinner during the preceding hour.

42 Fog or ice fog, sky visible. Fog has become thinner during the preceding hour.

41 Fog or ice fog in patches. Fog has begun or has become thicker during the preceding hour.

40 For or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer.

ww = 39-30	Use code figures 39-30 to report a duststorm, sandstorm, or drifting or blowing snow.
ww = 39-36	In deciding among code figures 39-36, the following must be considered: snow that is being moved by the wind may be generally low (below about 6 ft) or generally high (above 6 ft). If the snow is low, it is drifting snow; if high, it is blowing snow. Code figure 37 is not reported under United States rules.

39 Heavy blowing snow, generally high (above eye level). Visibility less than 5/16 mi.

38 Light or moderate blowing snow, generally high (above eye level). Visibility 6 mi or less but not less than 5/16 mi.

36 Drifting snow, generally low (below eye level).

ww = 35-30	In deciding among code figures 35-30 the following must be considered: if the visibility at the station at the time of observation is less than 5/16 mi, there is a severe duststorm or sandstorm; if the visibility is at least 5/16 mi but less than 5/8 mi, there is a light or moderate duststorm or sandstorm. The code figure used depends on the intensity of the duststorm or sandstorm and any change in its intensity during the preceding hour.

35 Severe duststorm or sandstorm that has begun or has increased during the preceding hour.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

34 Severe duststorm or sandstorm that has had no appreciable change during the preceding hour.

33 Severe duststorm or sandstorm that has decreased during the preceding hour.

32 Light or moderate duststorm or sandstorm that has begun or has increased during the preceding hour.

31 Light or moderate duststorm or sandstorm that has had no appreciable change during the preceding hour.

30 Light or moderate duststorm or sandstorm that has decreased during the preceding hour.

ww = 29-20 Use code figures 29-20 to report precipitation, fog, ice fog, or thunderstorm at the station during the preceding hour but not at the station at the time of observation. Use code figures 29-25 if the precipitation was showery; otherwise use code figures 24-20.

29 Thunderstorm (with or without precipitation).

Since by U.S. definition, a thunderstorm ends 15 minutes after the last thunder or lightning, the last thunder or lightning must have happened at least 15 minutes before the time of the observation.

28 Fog or ice fog.

The visibility in the fog or ice fog must have been less than 5/8 mi.

27 Shower(s) of hail, small hail, or ice pellets, or of rain and hail, small hail, or ice pellets.

26 Shower(s) of snow, or of rain and snow.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

25 Shower(s) of rain.

24 Freezing drizzle or freezing rain, not falling as shower(s).

23 Rain and snow or ice pellets, not falling as shower(s).

22 Snow not falling as shower(s).

21 Rain (not freezing), not falling as shower(s).

20 Drizzle (not freezing) or snow grains, not falling as shower(s).

ww = 19-00	Use code figures 19-00 to report certain hydrometeors, electrometeors, lithometeors or no precipitation at the station at the time of observation or during the preceding hour.

19 Funnel cloud(s), tornado, or waterspout at or within sight of the station during the preceding hour of the time of observation.

Since the highest code figure is reported (except code figure 17), code figure 19 cannot be used if **WW** can be encoded as some higher number.

18 Squalls. By U.S. definition, a sudden increase of at least 15 knots in average wind speed and sustained at 20 knots or more for at least 1 minute. This must occur at or within sight of the station during the preceding hour or at the time of observation.

If a squall without any precipitation is observed, either at the time of observation or during the past hour, use code figure 18. If there was any precipitation, or if there was a thunderstorm with the squall, use one of the other code figures, possibly code figure 29 or one of the code figures 99-80. Select the one that best describes what happened.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

ww = 17	Thunderstorm, but no precipitation at time of observation. Code figure 17 has priority over code figures 49-20 and 16-00.

17 Thunderstorm, but no precipitation at time of observation.

A thunderstorm is an electrical storm that may or may not be accompanied by precipitation. Since by U.S. definition, a thunderstorm does not end until 15 minutes after the last lightning or thunder, code figure 17 would be used if the thunderstorm occurred within 15 minutes of the observation.

16 Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station.

The precipitation must be 3 mi or less from the station, but not at the station to use code figure 16.

15 Precipitation within sight, reaching the ground or the surface of the sea, but distant; i.e., estimated to be more than 3 mi from the station.

14 Precipitation within sight, not reaching the ground or the surface of the sea.

Sometimes precipitation may fall from a cloud, but into air that is dry enough to evaporate it before it can reach the ground. This is fairly common in desert areas like some parts of the southwestern United States. This phenomena is called virga.

13 Lightning visible, no thunder heard.

There are two reasons you may see lightning but not hear thunder. The first is that the lightning may be far enough away that the thunder doesn't reach the station. The other is that local sounds may muffle the thunder. Use code figure 13 to report distant lightning.

ww = 12-10	Use code figure 12 or 11 to report shallow fog. Continuous refers to covering half or more of the ground or sea; patchy refers to less than one-half coverage. The apparent visibility shall be less than 5/8 mi. Code figure 10 is used to report fog that is neither shallow nor has visibility less than 5/8 mi. (Code figures 49-40 are used to report fog that is not shallow but with visibility less than 5/8 mi.)

12 More or less continuous shallow fog or ice fog at the station; the fog or ice fog is not deeper than about 6 ft.

11 Patches of shallow fog or ice fog at the station; the fog or ice fog is not deeper than

Table B-6. Coding of Present Weather, WW (Continued)

10 Mist

Code figure 10 refers only to water droplets and ice crystals. The visibility restriction shall be 5/8 mi or more but less than 7 mi. Use code figure 10 whether the mist is patchy or more or less continuous.

ww = 09-04	Use code figures 09-04 to report lithometeors.

09 Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour.

Visibility in dust or sand must be (or have been) 6 mi or less.

08 Well-developed dust whirl(s) (devils) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm.

07 Dust or sand raised by wind at or near the station at the time of observation, but no well-developed dust whirl(s) (devils) or sand whirl(s), and no duststorm or sandstorm seen.

Visibility at the time of observation must be 6 mi or less.

06 Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation.

This code figure may be used with any visibility, as long as there is dust in the air.

05 Haze

Code figure 05 is not restricted to the definition for reports of haze in the basic observation, but can be used if it is simply hazy, regardless of the visibility.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

04 Visibility reduced by smoke; e.g., veldt or forest fires, industrial smoke, or volcanic ash.

If the smoke is coming from a great distance, it will be spread through a deep layer of the atmosphere. In this case, use code figure 04 regardless of how much the visibility is restricted. If the smoke is coming from somewhere fairly close, then it will be pretty much layered in the lower atmosphere. In this case, the visibility has to be 6 mi or less before code figure 04 is used.

ww = 03-00	Phenomena without significance.

03 Clouds generally forming or developing.

Used only if there are clouds at the time of the observation, no other weather exists, and the clouds have increased or become more developed during the past hour.

02 State of sky on the whole unchanged. This is the characteristic of the sky during the past hour.

01 Clouds generally dissolving or becoming less developed. This is the characteristic of the sky during the past hour.

Used if the sky is clear at the time of observation, but there were clouds during the past hour. Also used when clouds have dissolved or become less developed during the past hour.

00 Cloud development not observed or not observable. This is the characteristic of the past hour.

Used if clouds were not observed during the past hour, whether the sky is clear or not at time of observation.

(See the Example Observations page)

EXAMPLE OBSERVATIONS

Sky: 3/8 moderate cumulus at 2100 feet, 1/8 stratocumulus at 5000 feet, 2/8 altocumulus (one level, opaque) at 12000 feet. State of sky generally becoming less developed during past hour.
Weather: Light rain shower ended 17 minutes before observation.
Code: 485702501

Sky: Clear sky with few patches of semi-transparent altocumulus at 15000 feet. Altocumulus covered 4/8 of sky during past hour.
Weather: None.
Code: 109300101

Sky: Surface-based obscuration in fog with 300 feet vertical visibility.
Weather: Fog with visibility 1/2 mile. Last hour had a partial obscuration (fog) and 8/8 stratus at 400 feet.
Code: 9////4747

Sky: 7/8 cumulonimbus (no anvil visible) at 1800 feet, 1/8 cirrus at 35000 feet, originating from cumulonimbus.
Weather: Moderate showers of rain and small hail. Lightning seen in distance (on horizon), but no thunder heard.
Code: 734038813

Sky: 8/8 stratocumulus (with breaks) at 4500 feet. State of sky unchanged during past hour.
Weather: None.
Code: 756//0202

Sky: 8/8 nimbostratus at 2100 feet. State of sky unchanged during past hour.
Weather: Light rain and drizzle. Patchy fog reducing visibility to 3 miles was present during past hour but not at time of observation. No other changes.
Code: 8052/5802

Appendix C - RRS Offline Maintenance

C.1 Introduction

This appendix includes basic instructions to allow the operator to provide maintenance personnel additional information beyond what is shown in the Hardware Status Window. The information provided can isolate problems with the RRS hardware, communications links, or surface observation reporting equipment. The RRS Offline Maintenance software may only be used when the RRS software is not in use.

C.2..Offline Maintenance Menu

The Offline Maintenance Menu shown in Exhibit C-1 is the primary window which provides the user with possible options to choose for further analysis or fault isolation. Activation of the options requires only a simple click of the mouse over the desired option and test. The possible options that may be entered for refined fault isolation include:

Intermet Maintenance
Sippican Maintenance
RSOIS Maintenance
PDB Maintenance
TRS Maintenance
UPS Maintenance
Interface Test

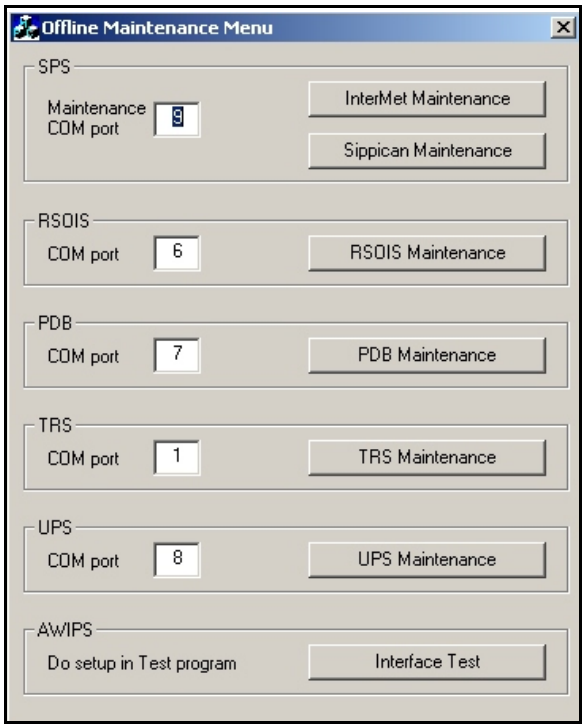


Exhibit C-1 Offline Maintenance Menu

C.2.1 Intermet Maintenance Option

The Intermet Maintenance Option when selected from the Offline Maintenance Menu provides the operator with detailed information on the Intermet SPS.

Not Available

C.2.2 Sippican Maintenance Option

The Sippican Maintenance Option when selected from the Offline Maintenance Menu provides the operator with detailed information on the Sippican SPS. Exhibit C-2A and C-2B provide an example of what information will be provided when this option is selected.

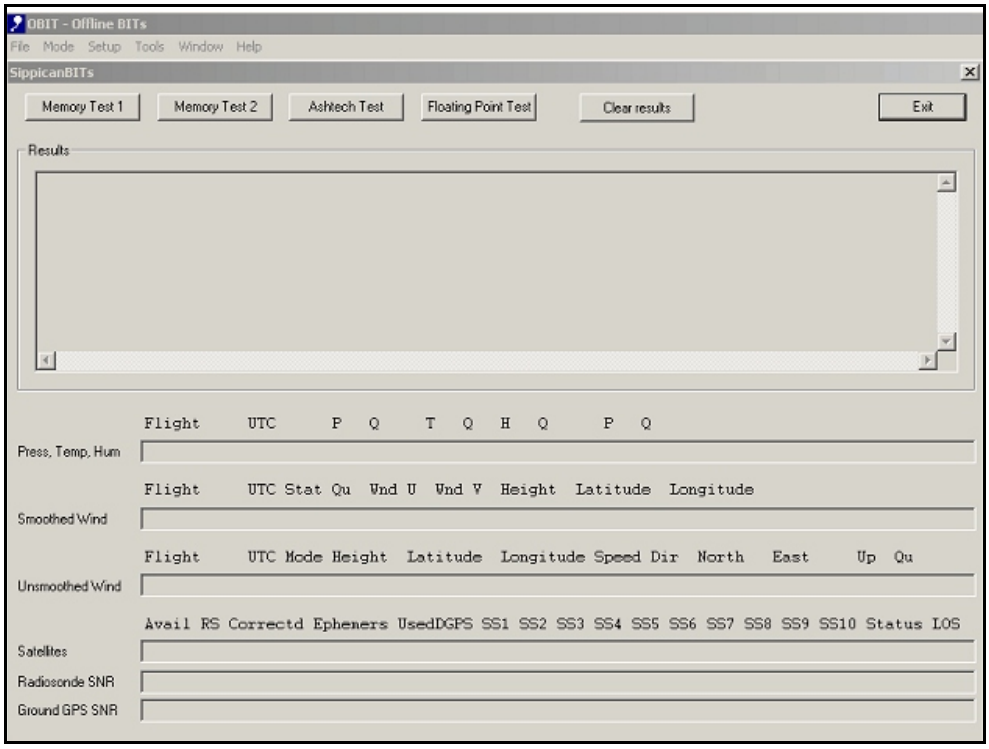


Exhibit C-2A Sippican SPS Maintenance Option

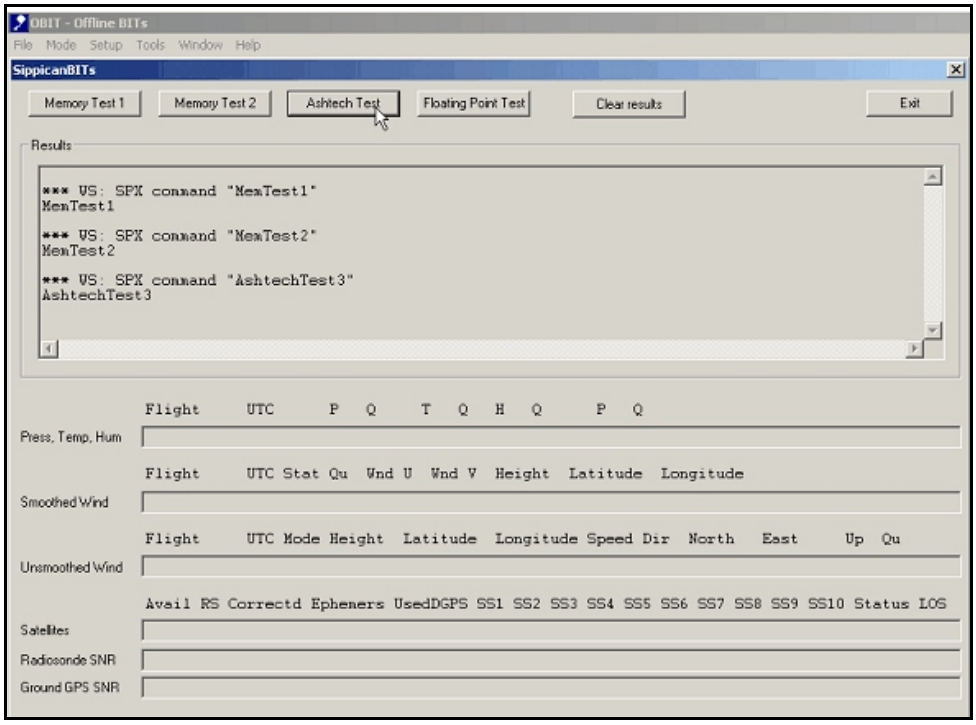


Exhibit C-2B Sippican SPS Ashtech Test

C.2.3 RSOIS Maintenance Option

The RSOIS Maintenance Option when selected from the Offline Maintenance Menu provides the operator with detailed information on the RSOIS. Exhibit C-3 provides an example of what information will be provided when this option is selected.

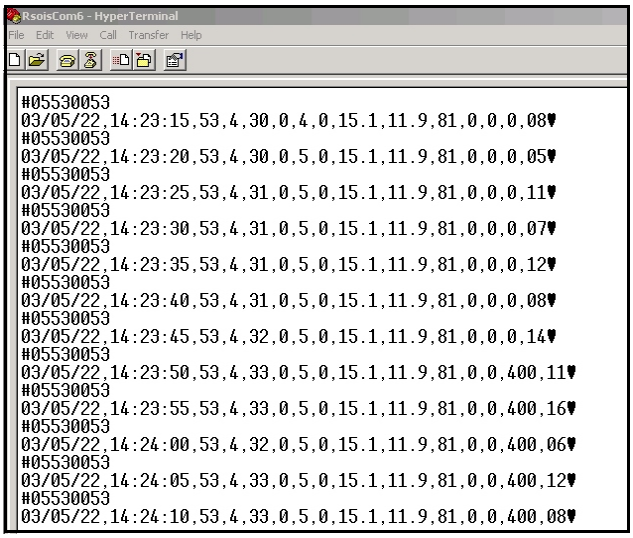


Exhibit C-3 RSOIS Maintenance

C.2.4 PDB Maintenance Option

The PDB Maintenance Option when selected from the Offline Maintenance Menu provides the operator with detailed information on the PDB. Exhibit C-4 provides an example of what information will be provided when this option is selected.

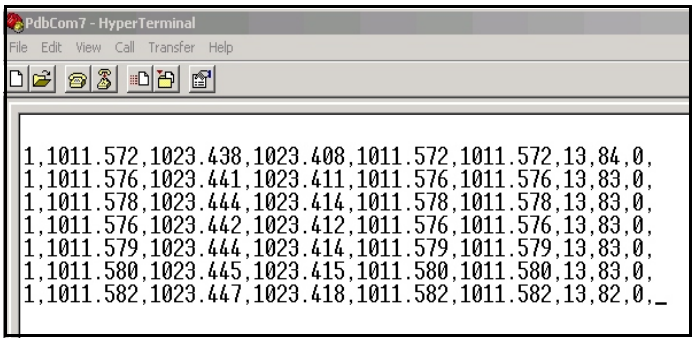


Exhibit C-4 PDB Maintenance

C.2.5 TRS Maintenance Option

The TRS Maintenance Option when selected from the Offline Maintenance Menu provides the operator with detailed information on the TRS. This option provides by far the most detailed information of the options that may be selected. Exhibit C-5 shows what options are available and C-5A provides an example of information when the SCA Test is initiated.

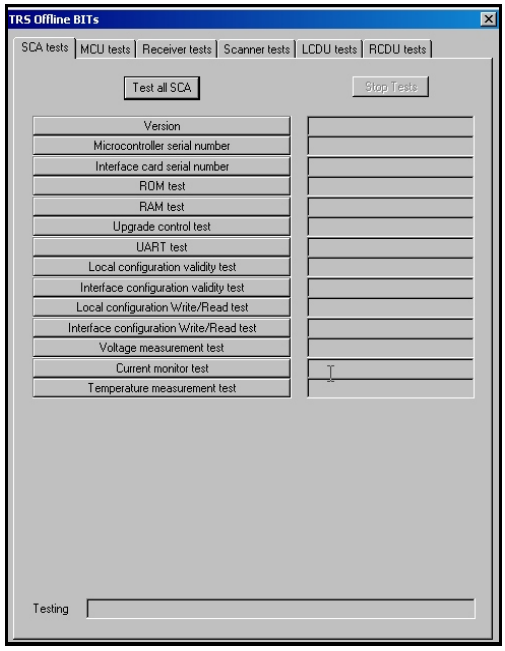


Exhibit C-5 TRS Menu

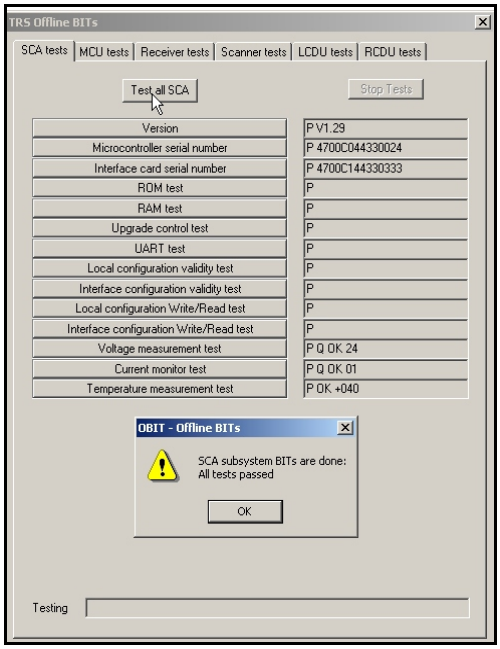


Exhibit C-5A SCA Tests

NOTE: When the TRS Offline Bits Menu is initially displayed the SCA Menu is displayed with the possible features that are tested.

C.2.5.1 MCU Tests

The MCU Tests is the second test series shown under the TRS Maintenance Option. When selected from the TRS Maintenance Window, it provides detailed information on the MCU. Exhibit C-5B provides an example of what information will be provided when this option is selected.

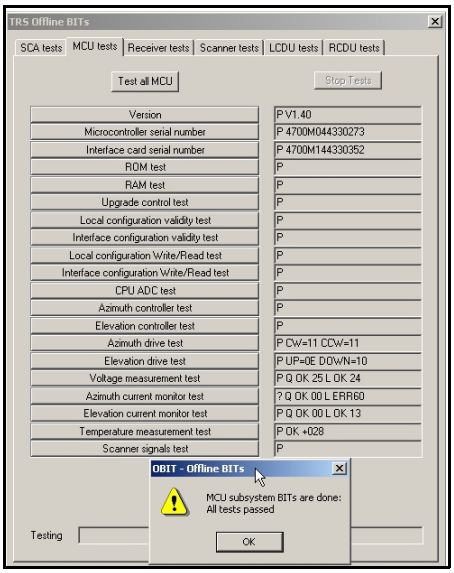


Exhibit C-5B MCU Tests

C.2.5.2 Receiver Tests

The Receiver Tests is the third test series shown under the TRS Maintenance Option. When selected from the TRS Maintenance Window, it provides detailed information on the receiver. Exhibit C-5C provides an example of what information will be provided when this option is selected.

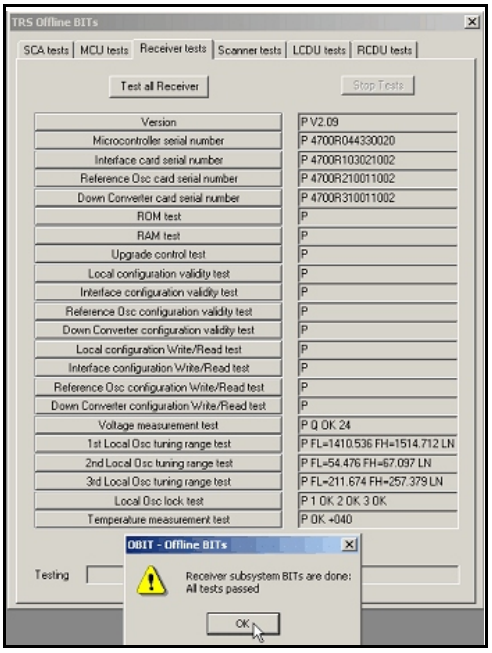


Exhibit C-5C Receiver Tests

C.2.5.3 Scanner Tests

The Scanner Tests is the fourth test series shown under the TRS Maintenance Option. It provides detailed information on the scanner. Exhibit C-5D shows the information provided.

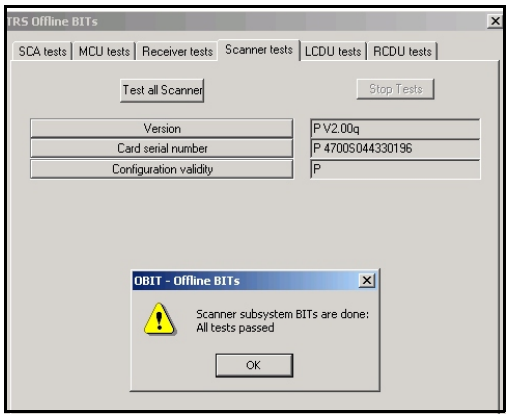


Exhibit C-5D Scanner Tests

C.2.5.4 LCDU Tests

The LCDU Tests is the fifth test series of the TRS Maintenance Option. It provides detailed information on the local control display unit in the radome. Exhibit C-5E shows the information provided.

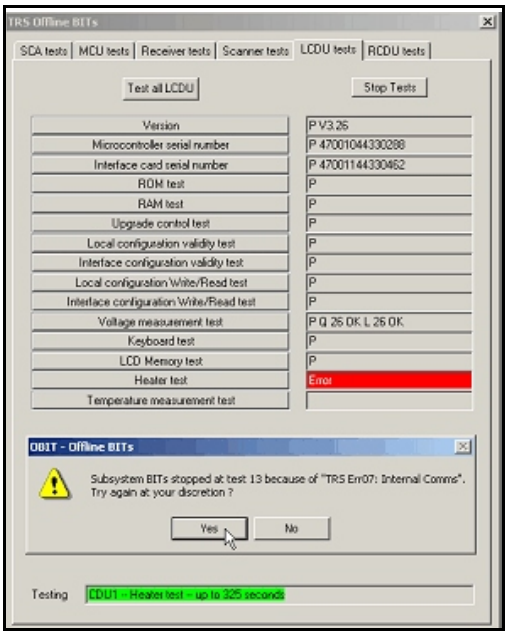


Exhibit C-5E LCDU Tests

C.2.5.5 RCDU Tests

The RCDU Tests is the final test series of the TRS Maintenance Option. It provides detailed information on the remote control display unit at the release point. Exhibit C-5F shows an "Error Message" requires maintenance notification and use of alternate release procedures until corrected.

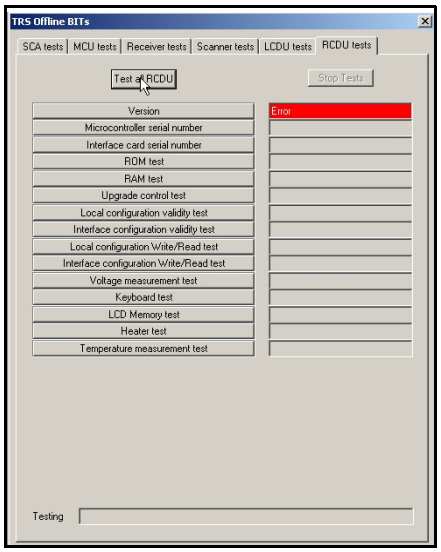


Exhibit C-5F RCDU Tests

C2.6 UPS Maintenance Option

The UPS Maintenance Option from the Offline Maintenance Menu provides the operator with detailed information on the UPS. Exhibit C-6 shows the information provided.

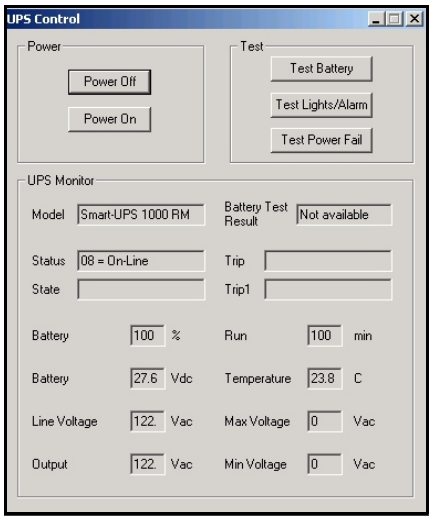


Exhibit C-6 UPS Tests

NOTE: The UPS Power options allows the operator to power on or off the power supply. The UPS control window can also be used to test the battery, lights, alarm and do a test power failure. The window also provides detailed information on the battery strength, voltage, temperature, and output. The initiation of the Battery Test is shown in Exhibit C-6A.

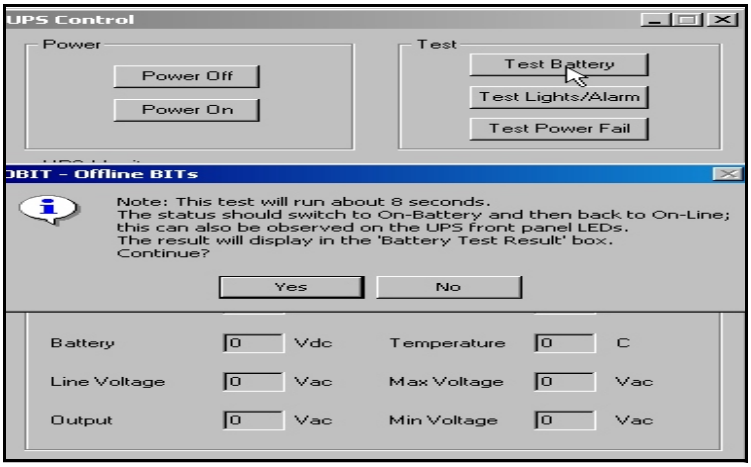


Exhibit C-6A Battery Test

APPENDIX D - RRS Popup Messages

1	A temporary file (%) from a previous Rework appears to be lingering.
2	RWS may not be able to load the flight radiosonde DLL correctly.
3	To avoid any problems, close RWS, delete the file manually and restart RWS.
4	Active Flight was changed from Release % to Release %
5	An Exception occurred. The plot window will be closed. You can continue with the application.
6	Antenna communication timed out.
7	Archiving failed. %
8	Are you sure you want to remove user % from RWS User Groups and OS user account? (Effect is immediate.)
9	Are you sure you want to remove user % from RWS User Groups?
10	Are you sure you want to turn Off UPS power?
11	This will shut down the power to SPS and TRS hardware !!!
12	Are you sure you want to turn On UPS power?
13	This will turn on the power to SPS and TRS hardware !!!
14	Attention: going into the Full Search Mode!
15	Azimuth of % is out of the range of 0 to 360.
16	Backup (%) and/or local (%) RWS database files are opened by some other processes. Cannot perform Consistency check. Application exiting.
17	Backup following files to specified backup folder (Backup Flight DB files)? %.
18	Backup of Master database was missing and copied from original.
19	Backup successful.
20	Balloon released %: observation is no longer a % % and will be flown as a % % observation.
21	Calibration data successfully saved.
22	Can not log current user off due to other running applications
23	Can not open the File
24	Cannot (re)-load Master Station Data.
25	Cannot open Maintenance Window.
26	Cannot open TRS command window.
27	Cannot remove self.
28	Cannot start flight, because Local Station Data has not been properly initialized.
29	Would you like to set the local station data now?
30	Cannot use values for free disk space check. Using defaults.
31	Closing the Flight commits all data, if any, modified during the Rework session.
32	Click Yes to commit changes and close the flight.
33	Click No to close without commit.
34	Cloud height reported, but no cloud type reported.
35	Cloud weather data needs to be either number or /.
36	Color is already used. Please select another one.
37	Configuration Information Saved

38	Copy failed.
39	Copy successful.
40	Could not close display
41	Could not continue because an error occurred in selecting which orientation corrections to use
42	Could not create flight display document classes
43	Could not create RWS backup folder (%). No backups will be made
44	Could not create system timer for status bar. Aborting application.
45	Could not create system timer. Aborting preflight.
46	Could not initialize ATL
47	Could not initialize security manager
48	Could not initialize system globals Registry may be corrupt, or incompatible version.
49	Could not load the user configuration for the processed tabular display
50	Could not open default workspaceRegistry may be corrupt
51	Could not save the configuration for the processed tabular display*/
52	Could not start a display
53	Could not start flight
54	See Debug log for more details
55	Could not start page
56	Could not start rework
57	See Debug log for more details
58	Couldn't open 942 test data file
59	Couldn't open 943 test data file
60	Couldn't open 944 test data file
61	Couldn't open 945 test data file
62	Couldn't open 946 test data file
63	Couldn't open 947 test data file
64	Data Updated
65	Database error: Failed to update Local Station Data. Possibly due to invalid entries. Please try again
66	Delete failed.
67	Delete successful.
68	Directory can not be used for multiple purpose. Please select a different directory
69	Do not have enough free disk space to run this flight.
70	Required Disk Space: % MBytes
71	Free Disk Space: % Mbytes
72	Do you REALLY want to abort preflight and go to offline mode?
73	Do you REALLY want to close this flight session and go to offline mode?
74	Do you REALLY want to close this rework session and go to offline mode?
75	Do you REALLY want to terminate this flight and go to offline mode?
76	Do you REALLY want to terminate this flight?

77	Do you want to cancel the baseline process and go back to Surface Observation screen?
78	Do you want to Delete/Undelete the marked rows?
79	Do you want to overwrite the configuration file named %?
80	Do you want to reject the baseline result and go back to Flight Equipment screen?
81	Edits to PDS have not been saved.
82	Saving now will be reflected the next time levels or messages are generated.
83	Not saving now will lose the recent changes.
84	Save now?
85	Elevation of % is out of the range of -10.0 to 91.5.
86	Enter a value above 0
87	Enter a Wind Speed value between 20 and 330
88	Enter Elapsed time range values.
89	Error - could not delete the selected item
90	Registry may now be corrupted
91	Error - Frequency must be between 1668.4 MHz and 1700 MHz
92	Error - item could not be loaded
93	Error - item could not be moved
94	Registry may now be corrupted
95	Error - name must be alphanumeric
96	Error - this name already exists
97	Error - user must supply a name
98	Error % bringing up help.
99	Error creating file to save calibration data to.
100	Error creating font when printing Calibration data.
101	Error creating pring dialog.
102	Error initializing printer.
103	Error occurred restoring files. Error is: %
104	The restore operation has been cancelled. RWS will shut down now.
105	Error occurred while backing up database files. Error is: %
106	Error occurred while backing up files. Error is: %
107	Error occured while backing up master DB. Error is: %
108	Error occured while checking the attributes of the specified directory.
109	Error opening report file.
110	Error Printing Messages
111	Error Printing Station Data
112	Error reading registry, cannot start flight.
113	Error Saving Data
114	Error Saving Messages
115	Error starting flight, "%".
116	Error while updating SPS status.

117	Error writing calibration data to file.
118	Exiting without properly closing can result in corruption or loss of data.
119	Do you want to gracefully shutdown all RWS processes before exiting?
120	Exiting without properly terminating and closing can result in corruption or loss of data.
121	Do you want to gracefully shutdown all RWS processes before exiting?
122	Failed internally
123	Failed to Delete Flight(s)
124	Failed to Export Flight(s)
125	Failed to find Code Table
126	Failed to find entry point
127	Failed to Import Flight
128	Failed to load DLL
129	Failed to modify the parameters in database and/or registry
130	Failed to remove Ascension number % from the database
131	Failed to update Antenna Lock-On Time. Refer to DEBUG log file.
132	Failed to update Ascension Data when constructing flight object. Refer to DEBUG log file.
133	Failed to update Balloon Release Time. Refer to DEBUG log file.
134	Failed to update Flight Termination Date/Time. Refer to DEBUG log file. Termination will continue.
135	Failed to update master station data
136	Failed to update the Flight Termination Date and Time in Flight Database.
137	Failed while re-setting security on RWS registry keys.
138	Failure during the initialization of Globals.
139	Fatal error with External Drive. Configured RWS backup folder (%) does not exist. Now using C:\RWSBackup for Backup
140	Field "%" from this page contains invalid data.
141	File Saved
142	Finished Importing Flight(s)
143	Flight (Ascension: %, Release: %) being archived does not have levels. The archive generated may not be complete.
144	To re-archive flight with levels: open flight in Rework, generate and persist levels, and then archive the flight.
145	Flight Ascension Number %, Release Number % was not exported - %
146	Flight Ascension Number %, Release Number % was exported
147	Flight Ascension Number %, Release Number % was not exported - unknown error
148	Flight was successful, and will be marked as the active release.
149	Flight was successfully imported.
150	Flight was successfully saved to the database.
151	NCDC archive can be generated using utility.
152	It is now safe to close the application.

153	Flight was terminated because there was no prerelease data
154	Geopotential Height must be between -50.0 to 45,000
155	Import failed. Given file (%) may not be a valid flight DB file.
156	Inconsistent Data: Frozen precipitation is reported, but temperature greater than 7 (C)
157	Inconsistent Data: Fog reported, while Dewpoint Temp is greater then 3(C)
158	Inconsistent Data: Precipitation is reported, but 3/8 or less cloud cover is reported!
159	Invalid Elapsed Time entered. Enter values between 0 and the actual flight elapsed time (% minutes, % seconds).
160	Invalid File Name
161	Invalid Observation Date and/or Time.
162	Invalid Release Date/Time found for flight (Asc: %, Rel: %).
163	Invalid release time
164	Invalid Time for Release.
165	Invalid time.
166	Invalid User Name or Password
167	It's % minutes or less away from the upper target release time. Do you want to change the observation time?
168	Local Station Data indicates that you will enter Surface Observation data manually, even though you are presently receiving RSOIS data.
169	Local Station Data is not properly initialized.Live flights cannot be run, until this is done. Would you like to do so now?
170	Main application is shutting down due to exception. See Debug Log for details
171	Master database was missing and copied from backup.
172	Master database was missing and re-installation will be necessary.
173	Re-install RWS, and import flights from backup directory (%).
174	Master Station Data Updated Successfully
175	Max Arc-Distance allowed is 300. Please re-enter
176	Maximum value must be greater than Minimum value
177	Message must be after Observation and within six hours
178	Message Transmission implicitly commits all rework data, if any, including PDS, levels, messages, etc. to the database.
179	Continue?
180	No levels present in the selected overlay flight.
181	No message can be sent.This may indicate that there is no message ready. This may indicate that the flight it is too late to transmit the message.
182	No message can be sent.
183	This may indicate that there is no message ready.
184	This may indicate that the flight it is too late to transmit the message.
185	No messages were selected for transmission!
186	No option was selected.
187	No Radiosonde DLLs found.

188	No user was selected. Please select a user before removing.
189	No valid termination date/time exist for the the selected flight.
190	Set termination time to %, % (the date/time when last good raw PTU data was recorded).
191	Not enough space left in the selected folder to create archives.
192	Not Implemented Yet
193	Note: Missing data during baseline. Continue?
194	Observation Hour should be between 00 and 23.
195	Observation Year should be between 2000 and 2038 - Windows Limitation.
196	One or more ports to communicate with external hardware have problems. See below for details:
197	One or more required files (RRSDB.mdb, HQStation.mdb, RRSFlightTemplate.mdb) are missing from the specified directory being restored from. Cannot restore files.
198	Only six variables are allowed to plot at a time.
199	Parameters updated, as shown.
200	Please enter the Antenna lock-on time.
201	Please Provide a value for "Previous Temperature (C)" field!
202	Please provide a value for: %
203	Please Provide a value for: CldWX (NhCLhCMCHWWWW)
204	Please provide a value!
205	Please select at least one category for X axis
206	Please specify which axis you will be working on.
207	Please verify your password.
208	Pressure must be between 0.01 to 1070
209	Previous flight (Ascension: %, Release: %) did not terminate cleanly. Flight has been recovered in database and CODE will be run. RWS will automatically open this flight for Rework.
210	Printed successfully
211	Printing single flights via the View button, may be a more desirable format Contine?
212	Printing will print on % pages (estimated). Continue?
213	Problem with file name to save calibration data to.
214	Report failed, no rows selected.
215	Report successfully generated.
216	Required free space (at least % bytes required) does not exist on the current filesystem for the restore operation.
217	The operation cannot be performed.
218	Restore completed successfully. RWS will shutdown now.
219	Restoring files involves deleting all existing RWS database files (master and flight DBs) from primary folder and copying the same from the specified backup folder. RWS will be shutdown after restoring the files.

220	Click Yes to continue or No to cancel.
221	RH can not be less than 5%.
222	RPX unable to turn Off UPS power
223	RPX unable to turn On UPS power
224	RRSART needs to be shutdown in order for the changes you made to take effect. Shutdown in progress
225	Running this application on 16 bit Windows (WIN32S) requires Version 4 or later.
226	RWS already started. (Timeout waiting for Mutex.)
227	RWS already started. (Mutex already created.)
228	Continuing may result in not backing up of files after your RWS session. In order to sync the Database files between primary and backup folders and continue, you must be at least a non-captive Site Administrator. Continue anyway?
229	RWS Flight or Master Database files in the primary and backup folders are not in sync. (In order to sync the Database files between primary and backup folders and continue, you must be at least a non-captive account or a Site Administrator). Continuing may result in not backing up files after your RWS session.Continue anyway?
230	Saving the flight to the database failed.Would you like to re-try?
231	Select list of files to backup by cliking on "Select Files.." button.
232	Since you are running a Simulated flight, messages will not be transmitted to the AWIPS LAN. Messages are discarded, but should be assumed to have been transmitted successfully. You will not receive any status or acknowledgement of the transmission.
233	Specified directory is a read-only directory. Specify another directory for creating archives.
234	SPS could not initialize - aborting preflight. See View->Hardware for more information.
235	Station Data updated successfully.
236	Successfully loaded Master Station Data.
237	Surface Pressure must be between 750 and 1070 hPa.
238	Surface temperature can not be smaller than Dewpoint temperature.
239	Synoptic flight was missed. Send a No Data message (Yes/No)?
240	Termination time successfully changed.
241	The % entered will result in an invalid dewpoint temperature value. Please enter another value.
242	The % entered will result in an invalid wet bulb temperature value. Please enter another value.
243	The above are required fields. Please try again.
244	The data has been entered into the file successfully
245	The dewpoint temperature entered will result in an invalid RH value. Please enter another dewpoint temperature.
246	The dewpoint temperature entered will result in an invalid Wet Bulb temperature value. Please enter another dewpoint temperature.
247	The Flight (Asc: %, Rel: %, Year: %, WMO #: %) cannot be archived. It originated at a

	different station.
248	The Flight DB file (%) for the selected flight does not exist. Cannot Overlay Flight.
249	The following messages will be transmited: {FZL MAN SIG ABV Are you sure you want to transmit Coded Message?
250	The 'From' time must be less than 'To' time
251	The pressure discrepancy must be greater than % hPa and less than % hPa. Cannot accept
252	The pressure value entered is invalid. Please change it.
253	The release time cannot be more than 30 seconds before or after the original release time.
254	The Surface Pressure entered will result in an invalid dewpoint temperature value. Please enter another value.
255	The Surface Pressure entered will result in an invalid wet bulb temperature value. Please enter another value.
256	The valid field length is % character(s).
257	The value must be an integer, not decimal
258	The value must be either an integer or a decimal
259	The value should not contain more than two decimal places
260	The wet bulb temperature entered will result in an invalid dewpoint temperature value. Please enter another wet bulb temperature.
261	The wet bulb temperature entered will result in an invalid RH value. Please enter another wet bulb temperature.
262	There are flights out of time sequence (one or more flights with timestamps with a time in the future). Continuing may produce unreliable results.Please delete all the flights with the future timestamps.
263	There is already a flight with ascension number % Incrementing assigned ascension number.
264	There is no backup folder configured or unable to write to the configured backup folder. You will be prompted for a backup folder to backup the flight and master databases.
265	There was an error in the configuration dialog creation
266	This flight had used an old version of RWS, and may be incompatible. Flights generated with a version before 1.0.2.4 or build 0.0.0.19 are likely to be incompatible and may cause unpredictable results.
267	This geopotential height already exists. Please try again
268	This geopotential height has not been reached yet. Please try again
269	This smoothed pressure already exists. Please try again
270	This smoothed pressure has not been reached yet. Please try again
271	This time has not been created yet. Please enter another time
272	This will finish the baseline process. Do you want to continue?
273	Time Interval must be a whole integer between 1 and 60.

274	Unable to copy database files. System message: %
275	Unable to delete one or nore flights from RWS backup folder
276	Unable to load Radiosonde DLL, "%"
277	Unable to load the flight for Rework. Closing flight.
278	Unable to open connection to backup master DB
279	Unable to remove selected flights.
280	Unable to remove selected flights. This is a definite software problem!
281	Unable to retreive Flight RadioSonde DLL into memory during loading of the Flight.
282	Unable to start RWS
283	Unknown Database Error: Processed data was not available for flight with Ascension: %d, Release: %d. The flight record was deleted from the database.
284	Unknown Database Error: No release time was available for %d flight(s). The flight record(s) was deleted from the database.
285	Unknown Database Error: No release time was available for flight with Ascension: %d, Release: %d. The flight record was deleted from the database.
286	Unknown error
287	Unknown error in retrieving ascension data for Ascension %, Release %.
288	Unknown error occurred while checking for backup and local repository contents for consistency.
289	Unknown error occurred. Unable to update Local Station Data.
290	Unknown Exception encountered during update of Antenna Lock-On Time.
291	Unknown Exception encountered during update of Ascension Data while constructing flight object.
292	Unknown Exception encountered during update of Balloon Release Time.
293	Unknown Exception encountered during update of Flight Termination Date/Time. Termination will continue.
294	Unknown exception occurred while trying to start hardware comms.
295	Unknown exception. Application will continue.
296	Update Completed
297	Update was not successful because one or more fields contain invalid data.
298	UPS (power source to SPS and TRS) is currently turned Off. Click Yes to turn it On now. If you chose to not turn it On now, you need to turn it On from the Hardware Status Display GUI.
299	UPS (power source to SPS and TRS) is currently turned On. Click Yes to turn it Off now.
300	User changes have not been saved. Save now?
301	Users updated, as shown.
302	Value entered must be between % and %. Please re-enter
303	Warning, only enough space for % flight(s)

304	WARNING: You have selected more than % flights to import. Only the first % flights will be imported
305	Would you like to run a new release of this ascension?
306	You already specified two categories for X axes. Please remove one before you add a new one.
307	You are about to delete the above selected flight Ascension numbers from the database. Are you sure about this?
308	You are about to exit pre-flight. Are you sure you want to do that?
309	You are not authorized to change files directly on the file system.
310	You are not authorized to run a live flight.
311	You are not authorized to run a rework.
312	You are not authorized to run a simulated flight
313	You are not authorized to run offline utilities.
314	You are not authorized to save or update flight data.
315	You are not authorized to transmit messages.
316	You are not authorized to update local station data.
317	You are not authorized to view hardware status from offline mode.You have made some changes to local station data. Do you want to exit and lose those changes?
318	You have selected the current flight. Cannot overlay on to self. Please choose another flight.
319	You must first select an item
320	You need to make an selection before editing
321	You will lose changes you made. Do you want to continue?
322	Your changes will be updated immediately. Do you want to continue?

APPENDIX E - Troubleshooting

E.1 Introduction

This appendix includes instructions for the operator to use if during pre-flight, in-flight, and post flight problems arise that require actions other than are typically needed for a normal flight.

E.2 Pre-flight Troubleshooting

There will be occasions when the ground equipment or the radiosonde does not function normally during the pre-flight sequence. It is up to the operator to try to diagnose the problem and take corrective action if possible. Even if the problem is beyond the operator's expertise, providing the electronics technician or others with what actually occurred before and after the event is vital to finding a solution.

NOTE: Document the problem by printing the display indicating the problem or do a screen capture by clicking the "Shift" button and the "Print Screen" button and saving the file to "Wordpad". (See paragraph E3.3)

E.2.1 Failure to Complete Warmup

The TRS may fail to complete warmup on occasions. The operator should first verify that the UPS is "ON" and if so, go ahead and click on the "Reset" TRS button. (See Exhibit E-1A)

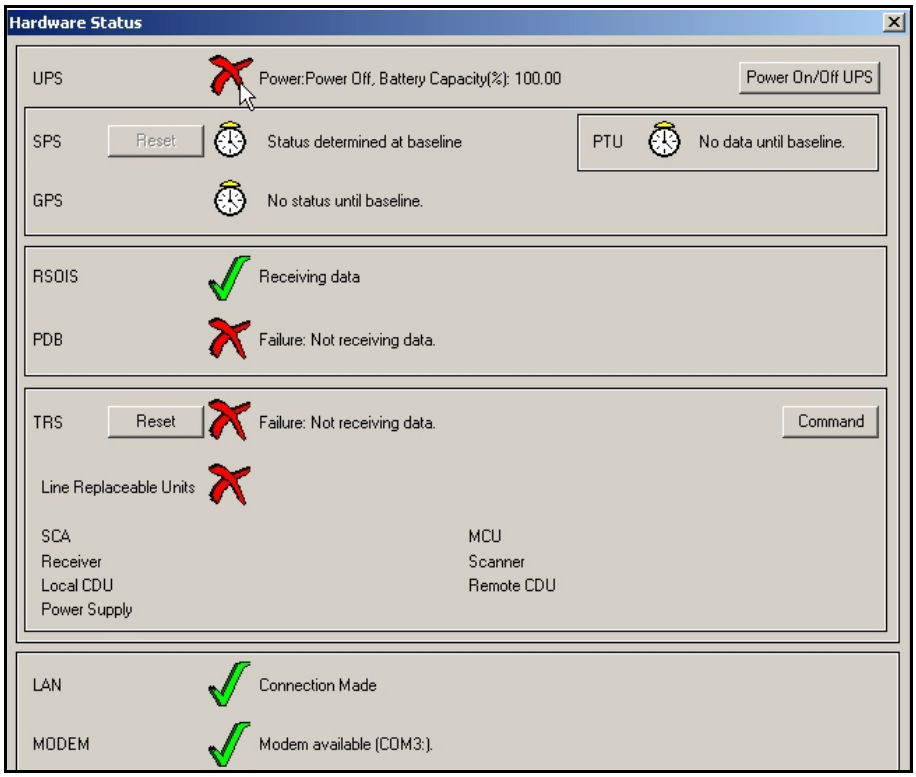


Exhibit E-1A Hardware Status Display

E2.2 No Antenna Control

During warmup and initialization the antenna can not be moved. After initialization if the antenna can not be moved or is moving erratically or rotating. Do the following:

1. At the Antenna Orientation/TRS Display check the AFC. If is On, turn it Off. Then click on the Manual mode button.

2. If step 1 does not work, at the Hardware Status Display turn the UPS Off and back On.

Exhibit E-1B UPS On/Off

3. If this does not work, contact an electronics technician and enter problem into EMRS.

E.2.3 SPS Failing to Initialize at Baseline

Occasionally the SPS will not initialize and the first step is to re-run the initialization process by clicking on the "Wait Again" button. Exhibit E-1C indicates the window during a normal initialization. Exhibit E-1D indicates the window when initialization fails.

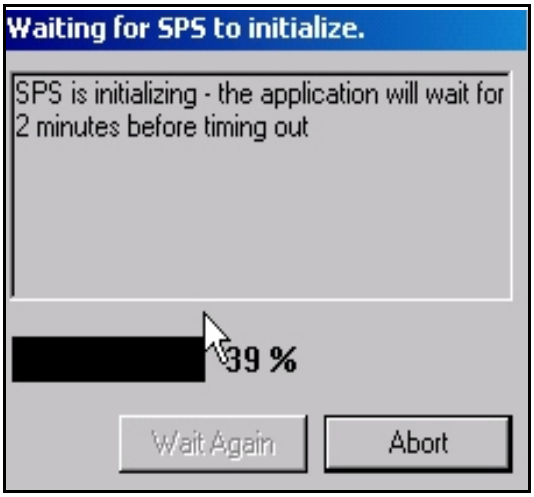


Exhibit E-1C SPS Initialization in Progress

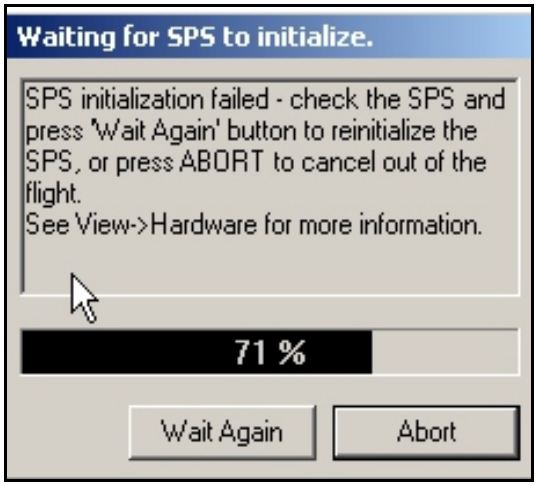


Exhibit E-1D SPS Failed Initialization

At this point the options are click the "Wait Again" button or "Abort". The "Abort" button takes you completely out of the Pre-flight sequence and into the Offline mode. This should not be exercised until attempting several things.

1. Ensure you have a good signal and the receiver is locked on to the radiosonde. This includes checking the azimuth and elevation the antenna is pointing. This also includes making sure there is no interference or noise in the area causing a degradation of the signal being received.

2. Disconnect and re-connect the battery from the radiosonde. Disconnect the Positive or Red wire first and then the Ground or Black wire and wait at least 30 seconds before reconnecting Ground or Black wire first.

NOTE: It is extremely important to ensure the battery was at a minimum of 5.6 volts before beginning baseline. The battery should be connected to the radiosonde a minimum of 5 minutes prior to beginning baseline. This allows the radiosonde's circuitry and the battery to stabilize.

NOTE: The pressure difference between the radiosonde and the PDB may be off considerably if the battery is not allowed to stabilize at least 5 minutes prior to starting baseline.

After following steps 1 and 2, go ahead and click on the "Wait Again" button. (See Exhibit E-1E) If this does work, take the battery out of the instrument and connect the radiosonde to the Power Supply and click the "Wait Again" button. If this does not work click the "Abort" button. (Shown in Exhibit E-1F.

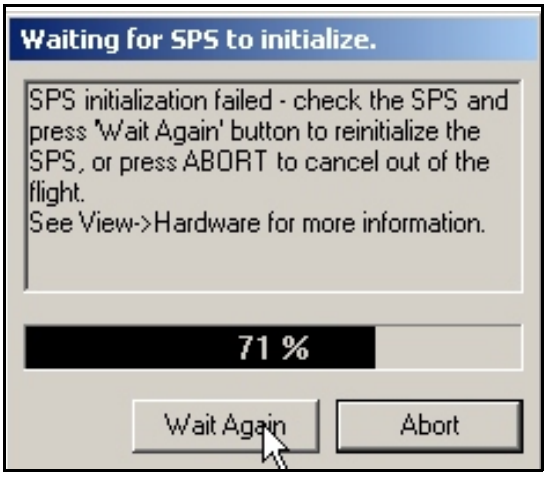


Exhibit E-1E Re-initializing the SPS

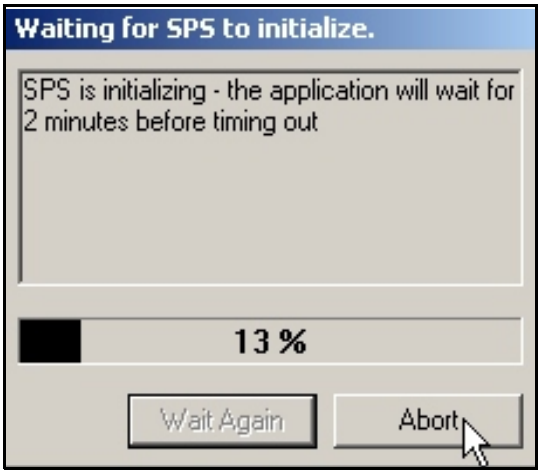


Exhibit E-1F Aborting Initialization

The next step prior to rejecting the radiosonde would be to go to the Hardware Status display and click on the SPS Reset button and re-attempt the baseline check. If this does not work click the UPS Reset button and retry the baseline check. If this does not work set the instrument aside .

E.2.4 No GPS at Baseline

If the SPS initializes, but there is no GPS do the following:

1. Verify Signal Strength, and Antenna Position, then, disconnect the battery and wait 30 seconds, before re-connecting to the radiosonde.

NOTE: Always disconnect the Positive or Red wire first and reconnect the Black or Ground wire first.

2. Go to the Hardware Status Display and press the "SPS Reset" button.

Re-initialize the SPS (This is a soft reboot) - If this does not work.

3. Click the "Power On/Off UPS" button on the Hardware Status Display. (This is a hard boot) It may require 15 minutes for the GPS module inside the SPS to reacquire the almanac. - ***If this does not work, get another radiosonde.***

E.3 In-flight Troubleshooting

There will be occasions during the flight when the operator must troubleshoot a problem before taking corrective action. A few problems that occur are:

Signal Loss
Missing Data
Antenna Not Tracking Properly
GPS Loss

E.3.1 Signal loss

Signal loss may occur because of numerous reasons the receiver may have shifted frequency, the radiosonde may have failed, the antenna may not be locked-on to the radiosonde. **If the signal strength shown in the Antenna Orientation/TRS Display drops to 14 or less the antenna will no longer be able to track properly.** One of the pop-ups that will alert this operator is the "Missing PTU " popup. (See Exhibit E-2A and E-2B)

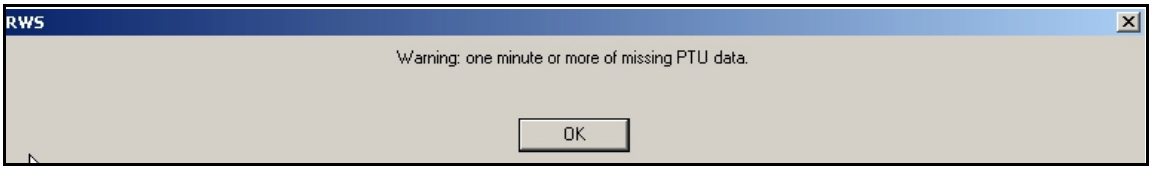


Exhibit E-2A 1-Minute Missing PTU Popup

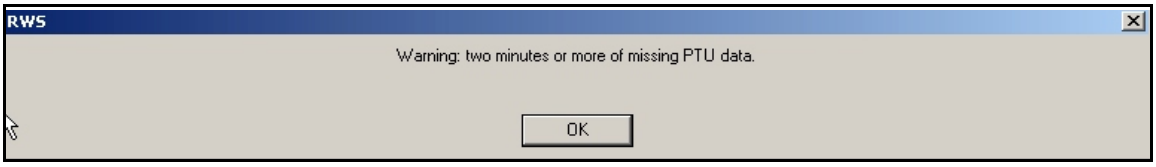


Exhibit E-2B 2-Minute Missing PTU Popup

An audible alarm will accompany this popup. The popup will occur at 1 and 2 minutes. If the PTU is still missing after 3 consecutive minutes, a final popup comes up terminating the flight. (See Exhibit E-3C)

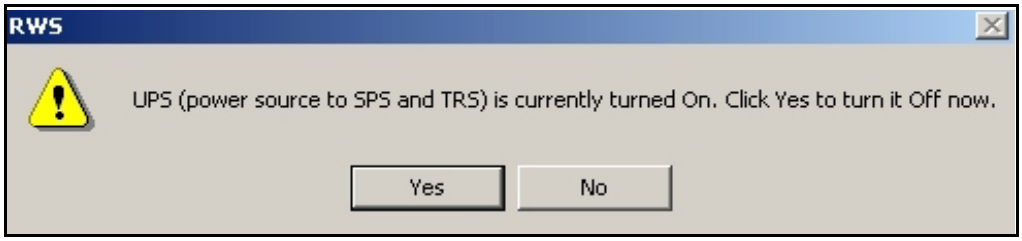


Exhibit E-2C Flight Terminated - UPS Turn Off Requested After 3 Minutes of Missing PTU

E.3.2 Corrective Actions

The operator must validate which problem exist when No Signal is received.

1. Check the frequency - Go to the Antenna Orientation/TRS Display. If the frequency has changed, the operator should:

   A. Press the "Set" button and type in the frequency selected during Pre-release.

   B. Press the "Up" or "Down" arrow to move the frequency until the signal is reacquired.

   C. Re-engage the AFC. If the frequency moves off frequency again, take out of AFC and continue the flight with AFC Off and notify electronics technician and enter information into EMRS.

2. Check the antenna tracking -

   A. Antenna Responds to Commands -

1) If GPS is still being received, select the "Search" button. The Search routine will move the antenna to the last known GPS location.

2) If the GPS signal is lost, the operator must look at the last usable position data and then manually move the antenna to that location.

NOTE: Under "Tables" open "Processed PTU" the last azimuth and elevation data points are shown. If GPS was lost, scroll up to find the last data point.

B. Antenna Control is lost - (Signal Strength shown in Antenna Display $\leq$ 14)

If control of the antenna is lost during the flight, and no response is given to commands entered through the Antenna Orientation/TRS Display. Two different options are available.

NOTE: Take the Antenna Tracking out of AFC and then place the Antenna in Manual Mode.

1.) Press the TRS "Reset" button on the Hardware Status Display.

Exhibit E.2.2 TRS Reset

NOTE: Write down the last azimuth/elevation and frequency.

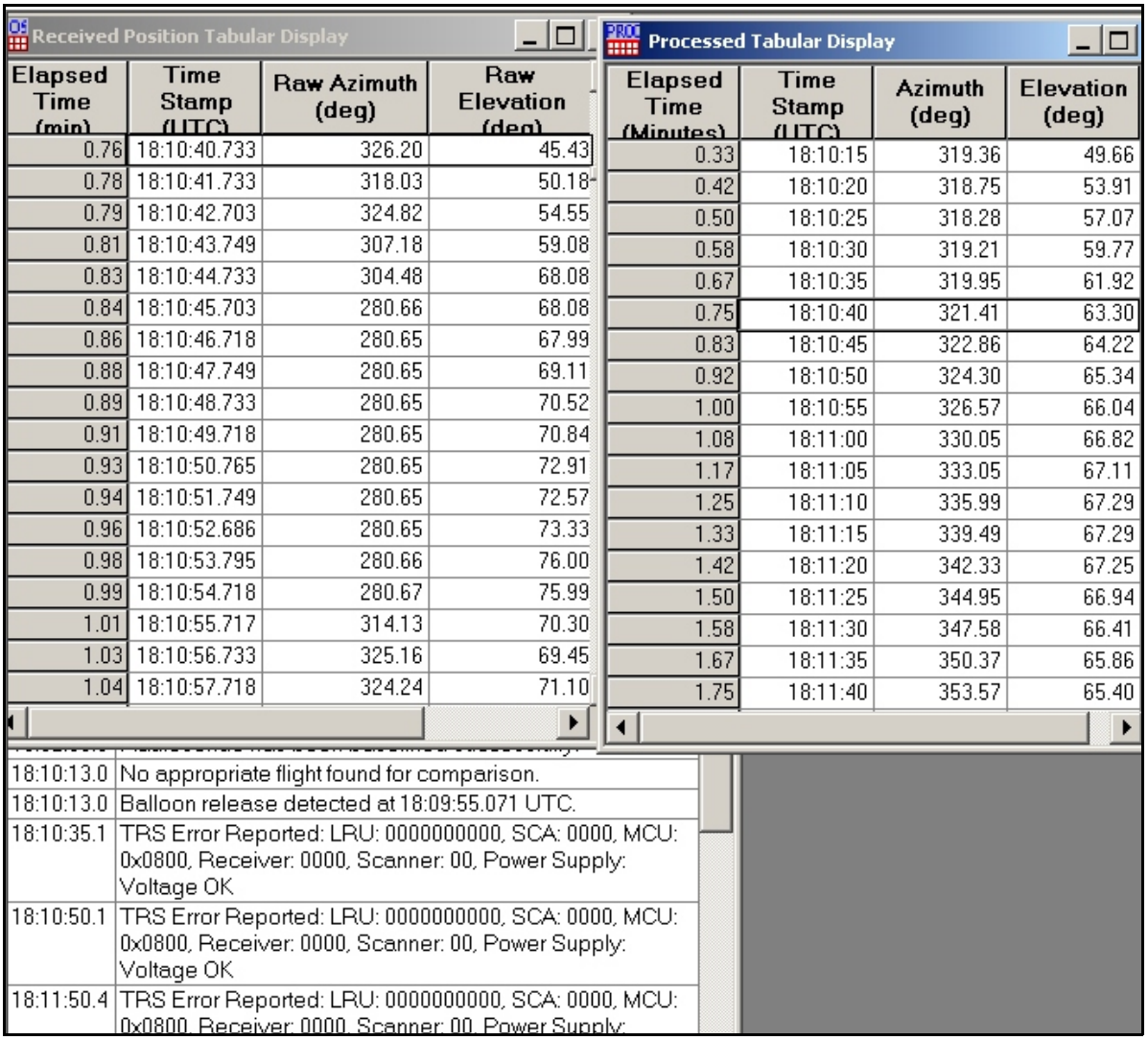
Once the TRS goes through re-initialization. The observer should using the Antenna Orientation/TRS Display reacquire the frequency and then relocate the radiosonde. Ensure the antenna is not in AFC. Using the procedures listed in items 1 and 2. It is important to remember that reacquiring the signal within 3 minutes is needed or the flight will automatically terminate for "Excessive Missing Data".

2) The operator may go to the CDU and hold the "Move" key for 4-5 seconds to unlock the antenna. After doing this, move the antenna to the last azimuth and elevation put in Auto track.

NOTE: At the CDU, the display prior to the operator action will show "Suspend".

E3.3 MCU Overload with Rapidly Changing Angles

It is not unusual especially with light winds for the elevation and azimuth angles to change rapidly over a short period of time. If the RAW azimuth and elevation angles from the TRS are changing rapidly the antenna motor current will increase and generate a TRS Status message if the conditions exists for more than four seconds. The tracking will be suspended for eight seconds. The Status Message that comes up for the TRS is the MCU: 0x0800 error. (See Exhibit E2.3)



Received Position Tabular Display

Elapsed Time (min)	Time Stamp (UTC)	Raw Azimuth (deg)	Raw Elevation (deg)
0.76	18:10:40.733	326.20	45.43
0.78	18:10:41.733	318.03	50.18
0.79	18:10:42.703	324.82	54.55
0.81	18:10:43.749	307.18	59.08
0.83	18:10:44.733	304.48	68.08
0.84	18:10:45.703	280.66	68.08
0.86	18:10:46.718	280.65	67.99
0.88	18:10:47.749	280.65	69.11
0.89	18:10:48.733	280.65	70.52
0.91	18:10:49.718	280.65	70.84
0.93	18:10:50.765	280.65	72.91
0.94	18:10:51.749	280.65	72.57
0.96	18:10:52.686	280.65	73.33
0.98	18:10:53.795	280.66	76.00
0.99	18:10:54.718	280.67	75.99
1.01	18:10:55.717	314.13	70.30
1.03	18:10:56.733	325.16	69.45
1.04	18:10:57.718	324.24	71.10

Processed Tabular Display

Elapsed Time (Minutes)	Time Stamp (UTC)	Azimuth (deg)	Elevation (deg)
0.33	18:10:15	319.36	49.66
0.42	18:10:20	318.75	53.91
0.50	18:10:25	318.28	57.07
0.58	18:10:30	319.21	59.77
0.67	18:10:35	319.95	61.92
0.75	18:10:40	321.41	63.30
0.83	18:10:45	322.86	64.22
0.92	18:10:50	324.30	65.34
1.00	18:10:55	326.57	66.04
1.08	18:11:00	330.05	66.82
1.17	18:11:05	333.05	67.11
1.25	18:11:10	335.99	67.29
1.33	18:11:15	339.49	67.29
1.42	18:11:20	342.33	67.25
1.50	18:11:25	344.95	66.94
1.58	18:11:30	347.58	66.41
1.67	18:11:35	350.37	65.86
1.75	18:11:40	353.57	65.40

18:10:13.0	No appropriate flight found for comparison.
18:10:13.0	Balloon release detected at 18:09:55.071 UTC.
18:10:35.1	TRS Error Reported: LRU: 0000000000, SCA: 0000, MCU: 0x0800, Receiver: 0000, Scanner: 00, Power Supply: Voltage OK
18:10:50.1	TRS Error Reported: LRU: 0000000000, SCA: 0000, MCU: 0x0800, Receiver: 0000, Scanner: 00, Power Supply: Voltage OK
18:11:50.4	TRS Error Reported: LRU: 0000000000, SCA: 0000, MCU: 0x0800, Receiver: 0000, Scanner: 00, Power Supply:

Exhibit E2.3 MCU 0x0800 Error Due to Difference in Raw and Processed Azimuth

E3.4 Corrective Action

If the Status Messages indicate a problem with the Motion Control Unit (MCU) the observer should take the antenna out of "Auto" track and place in "Manual" track mode until the azimuth and

elevation angles are changing less rapidly. This condition is not unusual with high elevation angles or when an wind direction change occurs over a very short period of time. The inability for the TRS to drive the antenna over wide angular changes without exceeding the voltage again is the cause of the condition. ***If allowed to go unchecked, after five such MCU messages the antenna will go into "Overload" and the observer will no longer be able to control the antenna.*** If this occurs, the TRS will have to be "Reset" from the Hardware Status Display. (See Exhibit E2.4)

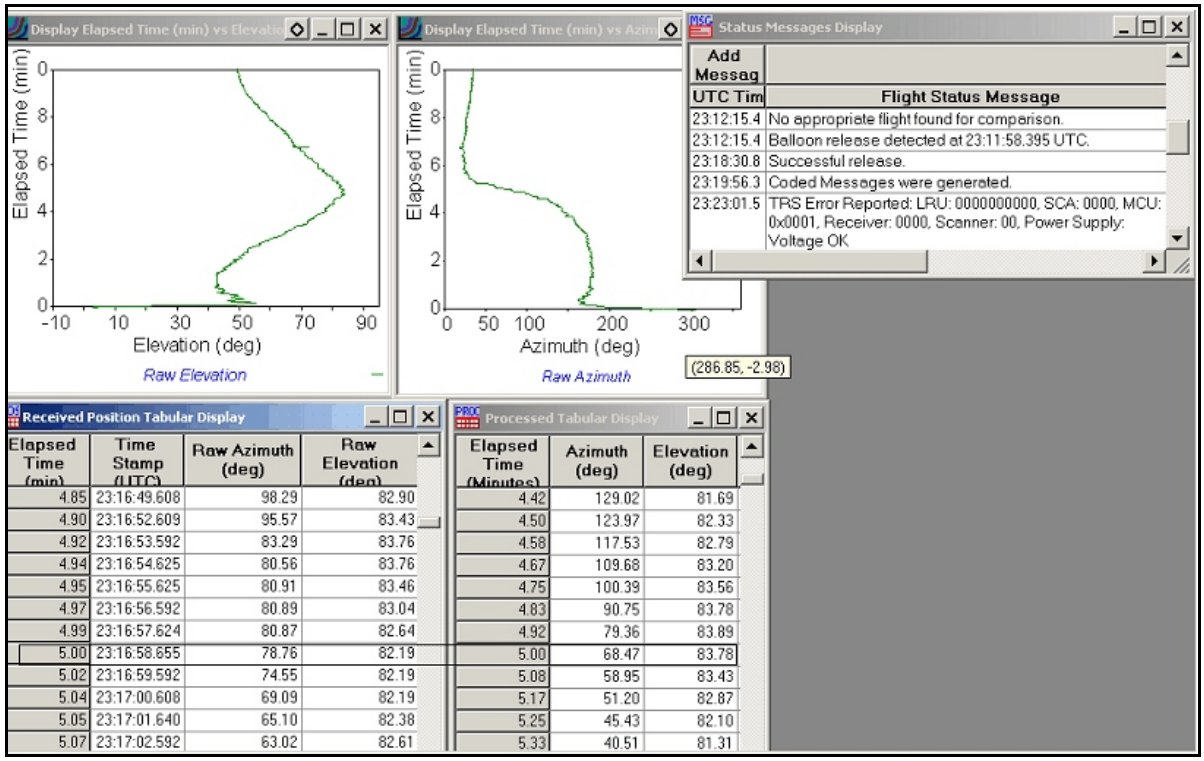


Exhibit E2.4 High Elevation Angles with Rapidly Changing Azimuth Angles

NOTE: Overhead conditions exist, when elevation angles increase are 80 degrees or higher, go ahead and place the antenna into "Manual" track mode. The antenna should be kept in "Manual" track until the elevation angles shown in the Processed Data Set decrease and show less erratic change.

E3.5 Doing a Screen Capture

The first step in performing a screen capture is recognizing a problem. This may be by noticing a "Red X" on the "Hardware Status" display, seeing a Status Message, getting a Popup message, or just noticing an incorrect data in the tabular display or plot.

The second step to capturing the problem is after displaying the items you wish to capture is to hit the "Shift" key while pressing the "Print Screen" button. Minimize the RRS Program by clicking on the minimize icon. (See Exhibit E2.5)

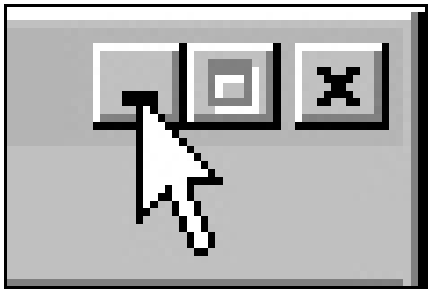


Exhibit E2.5 Minimize Icon

The third step in capturing data or a display is to open Wordpad. After opening Wordpad do the following:

1. At the "File" Option select "Page Setup" and select "Landscape" and click "OK".

2. Click on the "Edit" Option and select "Paste". This will bring the display you captured up.

3. At the "File" Option select "Save As". Then, go into the C:\RWS\RWS\Data Files subdirectory and name the file and save it. Suggest using 4 Ltr Station ID and abbreviated problem in filename.

E.4 Post-Flight Troubleshooting

If corrective action is taken to restore equipment operation and messages have not been transmitted. The observer may go into "Rework" and send the WMO Coded Messages up to 6 hours after flight termination.

Post-flight troubleshooting should also include going into the Offline Bit Utility (OBIT) and taking a closer look at equipment or Line Replaceable Unit indicating problems or failure. The data from the screen display after the diagnostics have run should be printed or captured for the electronics technician. An entry into the Engineering Management and Reporting System.